

# REPORT DOCUMENTATION PAGE

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6. AUTHOR(S)					
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) ROY F. WESTON, INC. WEST CHESTER, PA				8. PERFORMING ORGANIZATION REPORT NUMBER  93256R01	
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12a. DISTRIBUTION/AVAILABILITY STATEMENT  APPROVED FOR PUBLIC RELEASE; DISTRIBUTION IS UNLIMITED				12b. DISTRIBUTION CODE	
13. ABSTRACT (Maximum 200 words)  THIS REPORT CONTAINS INFORMATION RECOMMENDED IN THE DOCUMENT ENTITLED "GUIDANCE ON SETTING PERMIT CONDITIONS AND REPORTING TRIAL BURN RESULTS" (EPA/612/6-89/019), JANUARY 1989, AND HAS BEEN ORGANIZED INTO THE FOLLOWING NINE SECTIONS: (1) SUMMARY. (2) PROCESS OPERATION. (3) SAMPLING AND MONITORING PROCEDURES. (4) ANALYTICAL PROCEDURES. (5) TEST RESULTS. (6) QUALITY ASSURANCE SUMMARY. (7) VISITS AND AUDIT SUMMARY. (8) CLOSURE. (9) CONCLUSIONS.  <b>19960117 109</b>  <b>DTIC QUALITY INSPECTED 1</b>					
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INTERIM RESPONSE ACTION

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BASIN F LIQUID INCINERATION PROJECT

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DRAFT FINAL

**TRIAL BURN  
REPORT**

VOLUME III

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SEPTEMBER 1993

**TRIAL BURN SUMMARY REPORT  
FOR THE INTERIM RESPONSE ACTION  
BASIN F SUBMERGED QUENCH INCINERATION PROJECT**

**VOLUME III**

Prepared by:

**ROY F. WESTON, INC.**  
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West Chester, PA 19380

**DRAFT FINAL**  
September 1993

Accession For	
NTIS CS&I	<input checked="checked" type="checkbox"/>
DTIC TAB	<input type="checkbox"/>
Unannounced	<input type="checkbox"/>
Justification	
By	
Distribution/	
Availability Codes	
Dist	Avail and/or Special
A-1	

September, 1993

**APPENDIX B**

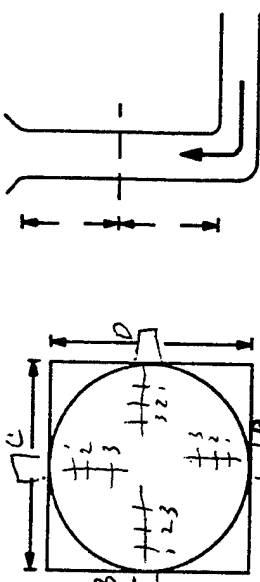
**SQI TRIAL BURN REPORT**

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CLIENT RMM-SQTPLANT SQTLOCATION STACKOPERATOR M. LolloneRUN NO. ONE DATE 6-10-93AMBIENT TEMP. (deg F) 66°BARO. PRESS. (in Hg) 24.79METER BOX NO. 1943METER BOX ΔH@ 1.943METER BOX CAL. (N) 0.923PROBE LENGTH (ft) 30"PROBE LINER MATERIAL BOZOPROBE HEATER SETTING 20K FACTOR (3.22)76.25 18.1 (72/183) (76/183)

## EPA METHOD 0050 FIELD DATA FORM



CROSS-SECTION PLAN OR ELEVATION

LEAK CHECKS

PITOT TUBE: INITIAL 500 FINAL 500METHOD THREE: INITIAL 500 FINAL 500

TRAVERSE POINT NUMBER	SAMPLING TIME (min)	24-HOUR CLOCK TIME	VELOCITY HEAD (delta P) (in. H <sub>2</sub> O)	ORIFICE PRESSURE DIFFERENTIAL (delta H) (in. H <sub>2</sub> O)	GAS METER READING (cubic ft.)	DRY GAS METER TEMPERATURE INLET (deg F) OUTLET (deg F)	SOURCE TEMP. (deg F)	PUMP VACUUM (in. Hg gauge)	IMPINGER EXIT GAS TEMP. (deg F)	FILTER BOX TEMP. (deg F)
A	0	0745.30	.42	1.30	473.372	72 71	182	2	56/194	248
1	10		.35	1.10	476.73	74 71	183	2	45/186	249
2	15		.53	1.70	483.59	76 72	183	2	45/222	250
3	20		.52	1.70	487.37	78 73	184	2	43/236	250
4	25		.61	1.90	491.37	80 73	183	2	44/243	251
5	30	815	.58	1.90	495.297	81 74	182	3	44/241	250
			(.7081843)	(1.607)	(21.9255)	(74.583)	(182.8357)			
B	0	0830	.42	1.50	495.674	79 76	183	3	51/224	250
1	10		.42	1.30	502.75	82 77	183	3	45/228	249
2	15		.60	1.90	506.73	83 78	184	3	44/225	250
3	20		.59	1.90	510.55	84 78	184	3	45/212	250
4	25		.62	2.01	514.68	84 78	184	4	45/219	249
5	30	0900	.72	2.34	518.9601	83 77	184	5	45/226	249
			(.7081843)	(1.607)	(21.9255)	(74.583)	(182.8357)			
			AVG. ΔP	AVG. ΔH	TOTAL V <sub>m</sub>	AVG. T <sub>m</sub>	AVG. T <sub>s</sub>	MAX. VAC.	MAX. TEMP.	MIN. MAX.
			0.754983	1.825	23.286	79.9466	183.666			

COMMENTS:

D<sub>2</sub> 3.2% CO<sub>2</sub> 10% PO<sub>2</sub> 10% PO<sub>2</sub> + A leaky Final 103/611g1.25 + C .017 @ 15 in T<sub>int</sub> Final .007 @ 10" H<sub>g</sub>1.25 + C .017 @ 15 in T<sub>int</sub> Final .007 @ 10" H<sub>g</sub>



CLIENT RMA - JQT  
PLANT SQT  
LOCATION

EPA METHOD 0050 FIELD DATA FORM

OPERATOR

RUN NO.

K FACTOR

M. Collins SHEET 2 OF 2  
ONE DATE 6/10/83  
3.25 13.28 15.29

TRAVERSE POINT NUMBER	SAMPLING TIME (min)	24-HOUR CLOCK TIME	VELOCITY HEAD (delta P) (in. H <sub>2</sub> O)	ORIFICE METER PRESSURE DIFFERENTIAL (in. H <sub>2</sub> O)	GAS METER READING (cubic ft.)	DRY GAS METER TEMPERATURE		SOURCE TEMP. (deg F)	PUMP VACUUM (in. Hg gauge)	IMPINGING EXIT GAS TEMP. (deg F)	FILTER BOX TEMP. (deg F)
						INLET (deg F)	OUTLET (deg F)				
C	0	0917			519.314	78	76	182	5	52/271	251
	1		.41	1.33	522.79	82	78	184	5	48/245	250
	2		.38	1.23	526.00	83	78	184	5	48/234	250
	3		.45	1.46	529.63	84	78	183	6	48/232	249
	4		.52	1.69	533.17	87	81	182	7	52/232	252
	5		.55	1.78	536.90	88	81	183	8	51/232	252
D	0	1002			540.834	88	81	183			
	1		.31	1.01	541.174	88	85	184	5	66/253	250
	2		.29	.94	547.08	91	86	184	5	50/251	250
	3		.41	1.34	550.42	93	87	184	7	49/249	252
	4		.50	1.64	553.93/554.36	94	88	184	8	51/246	252
	5		.50	1.64	558.01	92	89	184	7	59/275	253
Ave =	0	100269			562.082	94	89	184	9	52/222	249
	1		.61	2.00	562.082	94	89	184			
	2		.66	2.23	566.61	94	89	184			
	3		.66	2.23	566.61	94	89	184			
	4		.66	2.23	566.61	94	89	184			
	5		.66	2.23	566.61	94	89	184			
TOTAL	0	100269			87.391	81.333	183.38				
	1		.60	1.60	90.12	63.1					
	2		.60	1.60	90.12	63.1					
	3		.60	1.60	90.12	63.1					
	4		.60	1.60	90.12	63.1					
	5		.60	1.60	90.12	63.1					
COMMENTS:	0	100269			87.391	81.333	183.38				
	1		.60	1.60	90.12	63.1					
	2		.60	1.60	90.12	63.1					
	3		.60	1.60	90.12	63.1					
	4		.60	1.60	90.12	63.1					
	5		.60	1.60	90.12	63.1					

COMMENTS: Port + 0 10.008 @ 15" Hg \* Stop 10.22 Leak .005 @ 8 0.15 @ 15" Hg Star + a + 55.4.161 10.30  
Final .008 @ 10" Hg

# EPA METHOD 0050 HYDROCHLORIC ACID SAMPLE RECOVERY AND INTEGRITY DATA FORM

Plant RMA - SQF Sample Date 6-10-93  
 Sample Location Streh Run Number ONE  
 Sample Recovery Person JPO Recovery Date 6-10-93  
 Filter # 1417

## MOISTURE

### Impingers

	0.1N H <sub>2</sub> SO <sub>4</sub>	0.1N NaOH	Silica Gel
Final volume (wt)	<u>2782</u> ml	<u>213</u> ml	Final wt <u>321</u> g
Initial volume (wt)	<u>250</u> ml	<u>200</u> ml	Initial wt <u>300</u> g
Net volume (wt)	<u>2532</u> ml	<u>13</u> ml	Net wt _____ g
Total moisture	<u>2532 + 13 + 21 = 2566</u>		
Color of silica gel	<u>blue</u>		
Description of impinger water	<u>all clear</u>		

Front half acetate  
 Filter  
 Blank 0.1N H<sub>2</sub>SO<sub>4</sub> container number \_\_\_\_\_ Sealed  
 Blank 0.1N NaOH container number \_\_\_\_\_ Sealed  
 Blank distilled water container number \_\_\_\_\_ Sealed

### RECOVERED SAMPLE

RMA-TBURN-MSO-RN1-FHA  
RMA-TBURN-MSO-RN1-FILT ✓✓

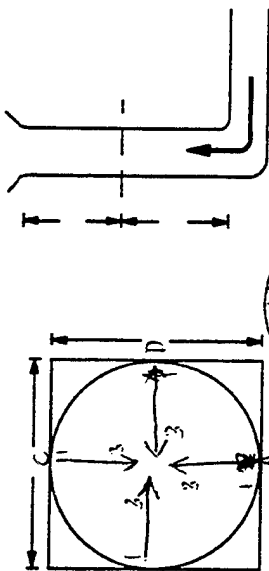
Description of particulate on filter very light tan

0.1N H<sub>2</sub>SO<sub>4</sub> Impingers container number RMA-TBURN-MSO-RN1-H<sub>2</sub>SO<sub>4</sub> Liquid level marked? ✓✓  
 0.1N NaOH Impingers container number RMA-TBURN-MSO-RN1-NaOH Liquid level marked? ✓✓  
 Samples stored and locked ✓ 200  
 Remarks: H<sub>2</sub>SO<sub>4</sub> TSV = 3000. ml

Date of laboratory custody \_\_\_\_\_  
 Laboratory personnel taking custody \_\_\_\_\_  
 Remarks: \_\_\_\_\_

CLIENT RMA-50 F  
 PLANT 50 F  
 LOCATION STACH  
 OPERATOR FRITZ  
 RUN NO. 012 DATE 6-10-93  
 AMBIENT TEMP. (deg F) 75°F  
 BARO. PRESS. (in Hg) 24.79  
 METER BOX NO. 15  
 METER BOX/ALH @ 2.010  
 METER BOX CAL. (Y) 9954  
 PROBE LENGTH (ft) 30'  
 PROBE LINER MATERIAL BORO  
 PROBE HEATER SETTING 25  
 K FACTOR 2.87

## EPA METHOD 0010 FIELD DATA FORM



CROSS SECTION End View PLAN OR ELEVATION

### LEAK CHECKS

PITOT TUBE: INITIAL Good FINAL Good  
 METHOD THREE: INITIAL Good FINAL Good

XAD NO. RMA-7BURN-M0010-RN1  
 XAD

TRAVERSE POINT NUMBER	SAMPLING TIME (min)	24-HOUR CLOCK TIME	VELOCITY HEAD (delta P) (in. H <sub>2</sub> O)	ORIFICE METER PRESSURE DIFFERENTIAL (delta H) (in. H <sub>2</sub> O)	GAS METER READING (cubic ft.)	DRY GAS METER TEMPERATURE INLET (deg F) OUTLET (deg F)	SOURCE TEMP. (deg F)	PUMP VACUUM (in. Hg gauge)	IMPINGER EXIT GAS TEMP. (deg F) <sub>Imp. Exit Temp.</sub>	FILTER BOX TEMP. (deg F)	XAD INLET TEMP. (deg F)
D 1	0	0745	.40	1.15	204.402	56 56	184	3.5	65	256	65
10	10		.37	1.06	207.34	60 57	184	4.0	47	256	66
15	15		.39	1.12	210.33	62 58	185	4.0	46	254	66
20	20		.41	1.18	213.62	64 59	185	4.5	46	254	67
25	25		.46	1.38	216.37	65 60	184	4.5	46	255	66
30	30		.47	1.35	219.75	68 61	184	5.0	47	256	67
35	35		.46	1.32	223.05	69 62	185	5.5	48	253	67
40	40		.47	1.35	226.21	71 64	186	6.0	48	257	68
45	45		.55	1.58	233.11	70 63	184	6.5	48	255	66
50	50		.55	1.58	236.61	71 64	185	6.5	50	255	66
55	55		.53	1.52	240.15	73 66	185	6.5	49	256	67
60	60	0645	.53	1.52	243.702	73 66	184	7.0	46	255	66
					Leak Check	0.4 @ 10" Hg					
A 1	0	0923			244.007						
15	15		.39	1.12	247.000	65 65	195	5.5	64	254	64
20	20		.41	1.18	250.00	69 67	185	6.0	45	256	65
25	25		.39	1.12	253.20	70 67	185	6.0	45	256	67
	TOTAL		AVG. ΔP	AVG. ΔH	TOTAL V <sub>m</sub>	AVG. T <sub>m</sub>	AVG. T <sub>s</sub>	MAX. VAC.	MAX. TEMP.	MIN.	MAX. TEMP.

COMMENTS: 27



CLIENT RMA-SQT  
PLANT SQT  
LOCATION STACK

EPA METHOD 0010 FIELD DATA FORM

OPERATOR FRITZ

RUN NO. 046

K FACTOR 2.87

DATE 6-10-93

SHEET 2 OF 3

TRAVERSE POINT NUMBER	SAMPLING TIME (min)	24-HOUR CLOCK TIME	VELOCITY HEAD (delta P) (in. H <sub>2</sub> O)	ORIFICE METER PRESSURE DIFFERENTIAL (in. H <sub>2</sub> O)	GAS METER READING (cubic ft.)	DRY GAS METER TEMPERATURE		SOURCE TEMP. (deg F)	PUMP VACUUM (in. Hg gauge)	IMPINGING EXIT GAS TEMP. (deg F)	FILTER BOX TEMP. (deg F)	XAD INLET TEMP. (deg F)
						INLET (deg F)	OUTLET (deg F)					
1	20		.39	1.12	256.38	73	68	185	6.0	47	240	67
2	25		.47	1.35	259.50	76	70	186	6.5	49	244	67
2	20		.49	1.41	262.98	79	72	186	7.5	49	245	68
2	35		.50	1.44	266.49	80	73	185	8.0	50	246	68
2	40		.46	1.32	269.42	82	74	185	7.5	51	246	65
3	45		.52	1.49	273.40	84	77	185	8.0	51	247	63
3	50		.52	1.44	276.93	86	79	186	8.0	51	249	64
3	55		.54	1.55	280.52	88	80	185	9.0	51	249	66
3	60	1023	.52	1.49	284.110	88	80	184	9.0	52	248	65
					Leak Check	.012 @ 12" Hg						
B	0	1057			284.452							
	5		.32	1.01	287.35	77	77	180	6.0	48	245	55
	10		.36	1.05	290.39	78	78	182	6.0	45	245	56
	15		.36	1.05	293.38	78	78	182	6.0	44	243	56
	20		.35	1.02	296.37	79	78	185	6.0	48	240	60
	25		.48	1.40	299.75	82	80	186	8.0	51	249	65
	30		.46	1.34	303.18	83	80	186	8.0	51	250	67
	35		.47	1.37	306.60	84	81	185	8.0	51	250	66
	40		.46	1.34	309.95	85	81	185	8.5	50	254	64
	45		.54	1.58	313.62	86	82	185	10.0	54	252	66
	50		.55	1.61	317.29	88	79	184	10.0	53	249	67
	55		.52	1.52	321.00	81	78	181	10.0	56	243	68
3	60	1157	.52	1.52	324.660	84	81	184	10.0	54	243	66
					Leak Check	.012 @ 13" Hg						
C	0	1401			325.268							
	5		.41	1.20	328.40	78	79	183	6.0	65	254	61
	10		.42	1.23	331.68	84	82	186	6.5	49	236	65
	15		.43	1.26	334.96	86	83	186	6.5	48	237	65
	TOTAL		AVG. $\Delta P$	AVG. $\Delta H$	TOTAL $V_m$	AVG. $T_m$		AVG. $T_s$	MAX. VAC.	MAX. TEMP.	MIN.	MAX. TEMP.

COMMENTS:



CLIENT RMN-SQT  
PLANT SQT  
LOCATION STACK

EPA METHOD 0010 FIELD DATA FORM

**OPERATOR**

**RUN NO.**

Don

Life

DATE \_\_\_\_\_

2-07-9

SHEET 3 OF 3

[illegible]

**COMMENTS:**

q:\shared\airteam\forms\0010FDF2.DRW

**EPA METHOD 0010  
SAMPLE RECOVERY AND INTEGRITY DATA FORM**

Plant RMA-JQE Sample Date 6-10-93  
 Sample Location SMALL Run Number ONE  
 Sample Recovery Person JPD Recovery Date 6-10-93

**MOISTURE**

<u>Impingers</u>	<u>Condensor</u>	<u>Silica Gel</u>
Final volume (wt) <u>4855</u> ml	Final wt <u>348</u> g	
Initial volume (wt) <u>200</u> ml	Initial wt <u>300</u> g	
Net volume (wt) <u>4655</u> ml	Net wt <u>48</u> g	
Total moisture <u>4655 + 48 = 4703</u>		
Color of silica gel <u>blue 60%</u>		
Description of impinger water <u>all clear</u>		

**RECOVERED SAMPLE**

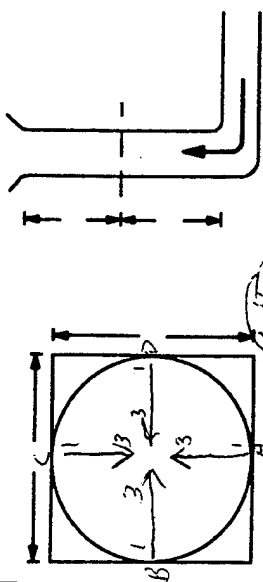
Blank Filter container number \_\_\_\_\_ Sealed \_\_\_\_\_  
 Blank XAD container number \_\_\_\_\_ Sealed \_\_\_\_\_  
 Filter/~~XAD~~ container number RMA-TBURN-MOOD-RN1-FILT Sealed /  
~~Filter~~/XAD container number RMA-TBURN-MOOD-RN1-XAD Sealed /  
 Filter/XAD container number \_\_\_\_\_ Sealed \_\_\_\_\_  
 Filter/XAD container number \_\_\_\_\_ Sealed \_\_\_\_\_  
 Description of particulate on filter \_\_\_\_\_  
 Condenser water container number RMA-TBURN-MOOD-RN1-COOD Liquid level marked? ✓  
 Front-half solvent  
   rinse container number RMA-TBURN-MOOD-RN1-FHS Liquid level marked? ✓  
 Impinger contents and back-half  
   water rinse container number RMA-TBURN-MOOD-RN1-CWD Liquid level marked? ✓  
 Back-half solvent  
   rinse container number RMA-TBURN-MOOD-RN1-BHS Liquid level marked? ✓  
 Water blank container number \_\_\_\_\_ Liquid level marked? \_\_\_\_\_  
 Solvent blank container number \_\_\_\_\_ Liquid level marked? \_\_\_\_\_

Samples stored and locked OK JPD 6/10/93 maintained  
 Remarks: cold

Date of laboratory custody 6-11-93  
 Laboratory personnel taking custody \_\_\_\_\_  
 Remarks: \_\_\_\_\_

CLIENT RMA-SQF  
 PLANT SQF  
 LOCATION STACK  
 OPERATOR DECARLO  
 RUN NO. 001 DATE 6-10-93  
 AMBIENT TEMP. (deg F) 75  
 BARO. PRESS. (in Hg) 24.79  
 METER BOX NO. 12  
 METER BOX CAL. (M) 2.012  
 PROBE LENGTH (ft) 30  
 PROBE LINER MATERIAL BRVD  
 PROBE HEATER SETTING 250  
 K FACTOR 208

## EPA METHOD 23 FIELD DATA FORM



CROSS SECTION  
 PLAN OR ELEVATION  
 LEAK CHECKS  
 PITOT TUBE: INITIAL GOOD FINAL GOOD  
 METHOD THREE: INITIAL GOOD FINAL GOOD

PITOT TUBE IDENTIFICATION NO. 181  
 PITOT TUBE CAL. FACTOR (C<sub>p</sub>) 0.840  
 NOZZLE IDENTIFICATION NO. BD20-355  
 AVG. NOZZLE DIAMETER (D), in. 0.355  
 PYROMETER IDENTIFICATION NO. 12  
 THERMOCOUPLE IDENTIFICATION NO. ---  
 ASSUMED MOISTURE, % 62  
 ASSUMED TEMPERATURE, deg F 181  
 STATIC PRESSURE (P<sub>static</sub>), in H<sub>2</sub>O -0.35  
 INITIAL LEAK RATE 0.012 @ 15 in Hg  
 MID-POINT LEAK RATE 0.015 @ 15 in Hg  
 FINAL LEAK RATE 0.010 @ 7 in Hg  
 XAD NO. RMH-T BURN-1723-RNT-X44

TRAVERSE POINT NUMBER	SAMPLING TIME (min)	24-HOUR CLOCK TIME	VELOCITY HEAD (delta P) (in. H <sub>2</sub> O)	ORIFICE METER PRESSURE DIFFERENTIAL (in. H <sub>2</sub> O)	GAS METER READING (cubic ft.)	DRY GAS METER TEMPERATURE INLET (deg F) OUTLET (deg F)	SOURCE TEMP. (deg F)	PUMP VACUUM (in. Hg gauge)	IMPINGER EXIT GAS TEMP. (deg F)	FILTER BOX TEMP. (deg F)	XAD INLET TEMP. (deg F)
C	0	07:45			450.635						
1	5		0.49	1.45	454.15	58	184	4	65	225	65
1	10		0.47	1.39	457.64	62	183	4	44	229	65
1	15		0.47	1.39	460.07	64	184	4	43	236	66
1	20		0.47	1.39	464.51	66	184	4.5	43	237	66
2	25		0.62	1.87	468.41	67	184	5.5	44	244	66
2	30		0.60	1.81	472.41	69	184	5.5	45	254	66
2	35		0.60	1.81	476.35	71	184	5.5	45	254	66
2	40		0.59	1.78	480.32	73	185	5.5	46	248	62
3	45		0.59	1.78	484.12	73	184	5.5	47	248	66
3	50		0.57	1.72	487.99	73	184	5.5	47	247	62
3	55		0.56	1.69	491.78	75	184	5.5	47	250	57
3	60	08:45	0.58	1.75	495.628	75	184		46	249	59
					LEAK CHECK OK @ 15" Hg @ 0.012						
B	0	09:23	0.43	1.30	495.946						
1	5		0.43	1.30	499.28	68	184	5.0	45	254	51
1	10		0.46	1.39	502.76	70	184	5.0	43	234	56
1	15		0.44	1.32	506.21	74	184		44	239	60
	TOTAL		AVG. VADP	AVG. ΔH	TOTAL V <sub>m</sub>	AVG. T <sub>m</sub>	AVG. T <sub>s</sub>	MAX. VAC.	MAX. TEMP.	MIN.	MAX. TEMP.

COMMENTS:



CLIENT RMA-SOI  
PLANT SOI  
LOCATION 307A

EPA METHOD 23 FIELD DATA FORM

OPERATOR

DeCarlo

RUN NO.

006

K FACTOR

3.04

DATE 6-10-93

SHEET 2 OF 3

TRAVERSE POINT NUMBER	SAMPLING TIME (min)	24-HOUR CLOCK TIME	VELOCITY HEAD (delta P) (in. H <sub>2</sub> O)	ORIFICE METER PRESSURE DIFFERENTIAL (in. H <sub>2</sub> O)	GAS METER READING (cubic ft.)	DRY GAS METER TEMPERATURE		SOURCE TEMP. (deg F)	PUMP VACUUM (in. Hg gauge)	IMPINGER EXIT GAS TEMP. (deg F)	FILTER BOX TEMP. (deg F)	XAD INLET TEMP. (deg F)
						INLET (deg F)	OUTLET (deg F)					
P	15				506.21							
	30		.44	1.34	509.65	77	70	184	5.0	46 341 340	248	59
	45		.49	1.49	513.30	79	72	184	5.5	48 248 248	248	60
	30		.49	1.49	516.74	81	73	184	6.0	47 252 247	247	62
	45		.49	1.49	520.3	83	75	185	6.0	47 251 248	248	62
	40		.47	1.43	524.12	84	76	184	6.0	47 251 248	248	61
	30		.50	1.52	527.52	86	78	183	6.5	47 251 248	248	62
A	30		.52	1.59	531.21	88	80	185	7.0	49 259 250	250	63
	55		.56	1.71	534.97	89	81	184	8.5	49 243 249	249	63
	60	10:23	.53	1.62	538.124	89	82	184	9.0	49 236 248	248	62
					LEAK CHECK OK @ 0.13 @ 11" Hg							
	0	10:57			539.236							
	15		.39	1.20	542.54	85	84	183	7.5	49 275 247	247	30
	30		.38	1.16	545.77	80	81	182	7.5	48 225 245	245	54
D	15		.39	1.19	548.97	80	80	183	8.5	45 246 252	252	56
	30		.37	1.14	552.24	80	80	183	8.5	48 261 253	253	60
	45		.39	1.19	555.41	83	81	184	9.5	50 257 254	254	63
	30		.39	1.21	558.62	84	84	184	9.5	51 240 255	255	63
	45		.39	1.21	561.87	86	82	184	10.0	53 236 258	258	63
	30		.47	1.45	565.14	87	83	184	11.5	55 236 257	257	62
	45		.43	1.33	568.98	87	83	184	11.5	54 236 256	256	56
D	30		.44	1.36	572.14	85	84	184	4.5	55 253 257	257	54
	45		.44	1.36	575.61	87	83	184	5.0	50 237 256	256	64
	60	11:10	.46	1.42	579.209	85	83	184	5.0	50 239 253	253	65
		11:57			LEAK CHECK OK @ 0.16 @ 15							
	0				581.237							
	15	14:01	.44	1.36	579.864							
	30		.44	1.36	583.39	80	80	181	5.0	59 223 251	251	65
D	15		.44	1.36	586.75	85	83	184	5.0	51 250 255	255	67
	30		.45	1.39	590.34	88	84	185	5.0	50 260 257	257	66
	TOTAL		AVG. ΔP	AVG. ΔH	TOTAL V <sub>m</sub>	AVG. T <sub>m</sub>	AVG. T <sub>s</sub>	MAX. TEMP.	MAX. VAC.	MAX. TEMP.	MIN.	MAX. TEMP.

COMMENTS:

Filter Change @ 11:38 @ 515.989 / Leak Check OK @ 14.5 @ 0.14 / 15" @ 56.4 @ 11.5  
@ 10:40 506.77  
0.24

CLIENT EMA-SQT  
PLANT SQT  
LOCATION STACUK

## EPA METHOD 23 FIELD DATA FORM

OPERATOR DCurto SHEET 3 OF 3  
 RUN NO. DAF DATE 6-10-97  
 K FACTOR 3.12 3.09

OPERATOR DCurto SHEET 3 OF 3  
 RUN NO. DAF DATE 6-10-97  
 K FACTOR 3.12 3.09

OPERATOR DCurto SHEET 3 OF 3  
 RUN NO. DAF DATE 6-10-97  
 K FACTOR 3.12 3.09

[illegible]

COMMENTS:						TER
SQF nozzle pulled and cleared at 1400	100	1700	8/1	10/68	828'5	MAX.
					4.5	65
					- test delayed until	



EPA METHOD 23 (PCDD/PCDF)  
SAMPLE RECOVERY AND INTEGRITY DATA FORM

Plant RMA-SQT Sample Date 6-10-93  
Sample Location SMALL Run Number ONE  
Sample Recovery Person JDO Recovery Date 6-10-93

MOISTURE

Impingers Silica Gel  
Final volume (wt) 5051 ml \_\_\_\_\_ ml Final wt 341 g \_\_\_\_\_ g  
Initial volume (wt) 200 ml \_\_\_\_\_ ml Initial wt 300 g \_\_\_\_\_ g  
Net volume (wt) 4951 ml \_\_\_\_\_ ml Net wt 41 g \_\_\_\_\_ g  
Total moisture 4951 + 41 = 4892  
Color of silica gel blue 20%  
Description of impinger water all clean

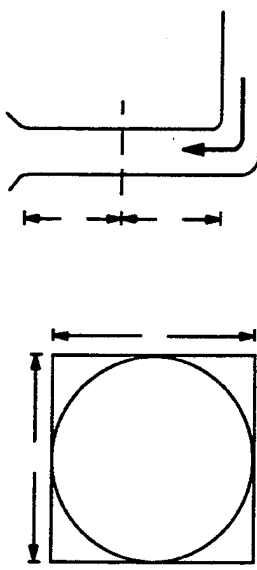
RECOVERED SAMPLE

Blank Filter container number \_\_\_\_\_ Sealed \_\_\_\_\_  
Filter container number RMA-TBURN-M23-RN1-FILT Sealed ☒  
Blank XAD container number \_\_\_\_\_ Sealed \_\_\_\_\_  
XAD container number RMA-TBURN-M23-RN1-XAD Sealed ☒  
Description of particulate on filter \_\_\_\_\_  
Front-half acetone rinse container number RMA-TBURN-M23-RN1-FHS Liq. lev. marked? ☒  
Front-half methylene chloride rinse container number 11 Liq. lev. marked? \_\_\_\_\_  
(6 of 6) Back-half water container number RMA-TBURN-M23-RN1-COUD Liq. lev. marked? ☒  
Back-half methylene chloride solution rinse RMA-TBURN-M23-RN1-BHS Liq. lev. marked? ☒  
Toluene QA / QC rinse RMA-TBURN-M23-RN1-TOL Liq. lev. marked? ☒  
Blank distilled water container number \_\_\_\_\_ Liq. lev. marked? \_\_\_\_\_  
Blank acetone container number \_\_\_\_\_ Liq. lev. marked? \_\_\_\_\_  
Blank methylene chloride container number \_\_\_\_\_ Liq. lev. marked? \_\_\_\_\_  
Samples stored and locked ☒ 24 JDO maintained cold  
Remarks: \_\_\_\_\_

Date of laboratory custody \_\_\_\_\_  
Laboratory personnel taking custody \_\_\_\_\_  
Remarks: \_\_\_\_\_

CLIENT RMK-S&E  
 PLANT S&E  
 LOCATION STAC  
 OPERATOR HILL  
 RUN NO. 006 DATE 6-10-93  
 AMBIENT TEMP. (deg F) 27.5-30  
 BARO. PRESS. (in Hg) 24.79  
 METER BOX NO. 1542  
 METER BOX/CH@ 1542  
 METER BOX CAL. (Y) 2923  
 PROBE LENGTH (ft) 30"  
 PROBE LINER MATERIAL TEFLON  
 PROBE HEATER SETTING N/A  
 K FACTOR 3.0 900pm  
18173

# Cr +6 FIELD DATA FORM



CROSS SECTION  
 PLAN OR ELEVATION

LEAK CHECKS  
 PITOT TUBE: INITIAL ✓ FINAL ✓  
 METHOD THREE: INITIAL ✓ FINAL ✓

PITOT TUBE IDENTIFICATION NO. P53  
 PITOT TUBE CAL. FACTOR (C<sub>p</sub>) 1.89  
 NOZZLE IDENTIFICATION NO. 0146 355A  
 AVG. NOZZLE DIAMETER (D), in 1.354  
 PYROMETER IDENTIFICATION NO. 1076416  
 THERMOCOUPLE IDENTIFICATION NO. 62  
 ASSUMED MOISTURE, % 62  
 ASSUMED TEMPERATURE, deg F 181  
 STATIC PRESSURE (P<sub>static</sub>), in H<sub>2</sub>O 1.24  
 INITIAL LEAK RATE 1006 @ 15 in Hg  
 MID-POINT LEAK RATE 1003 @ 10 in Hg  
 FINAL LEAK RATE 1003 @ 10 in Hg

TRAVERSE POINT NUMBER	SAMPLING TIME (min)	24-HOUR CLOCK TIME	VELOCITY HEAD (delta P) (in. H <sub>2</sub> O)	ORIFICE METER PRESSURE DIFFERENTIAL (delta H) (in. H <sub>2</sub> O)	GAS METER READING (cubic ft.)	DRY GAS METER TEMPERATURE		SOURCE TEMP. (deg F)	PUMP VACUUM (in. Hg gauge)	IMPINGER EXIT GAS TEMP. (deg F)	KOH RECIR. RATE (ml/min)
						INLET (deg F)	OUTLET (deg F)				
C 1 S	0	1130	143	1.79	562.823	86	83	183	3.0	66	50
	10		147	1.41	566.1	88	86	183	3.0	54	
	215		148	1.44	569.4	89	86	183	7.0	52	
	220	STATIC	148	1.44	573.1	90	86	182	7.0	60	
	335	1229	144	1.32	576.8	91	86	182	6.0	61	
D A 1 S	0	1200	143	1.29	580.2	91	86	183	6.0	58	
	10	*		LC Good @	583.581	10" HG					
	215	1359	144	1.32	583.834	84	83	182	3.0	68	50
	220		149	1.47	587.1	86	84	184	5.0	49	
	335		144	1.26	590.5	90	86	183	6.0	50	
TOTAL	0		136	1.32	593.9	92	86	184	6.0	52	
	10		136	1.08	597.3	94	87	193	6.0	59	
	215	1429	134	1.02	600.5	86	84	184	5.0	63	
	220			LC	603.509	86	84				
	335			LC	603.509	86	84				
TOTAL			AVG. ΔP	AVG. ΔH	TOTAL V <sub>m</sub>	AVG. T <sub>m</sub>		AVG. T <sub>s</sub>	MAX. VAC.	MAX. TEMP.	

COMMENTS: \* North Change out AT burners ~ 90 min. delay



CLIENT RM4-SQT  
PLANT SQT  
LOCATION STACK

# Cr +6 FIELD DATA FORM

OPERATOR WILL  
RUN NO. DOE  
K FACTOR

SHEET 2 OF 2

DATE 6-10-93

TRAVERSE POINT NUMBER	SAMPLING TIME (min)	24-HOUR CLOCK TIME	VELOCITY HEAD (delta P) (in. H <sub>2</sub> O)	ORIFICE METER PRESSURE DIFFERENTIAL (delta H) (in. H <sub>2</sub> O)	GAS METER READING (cubic ft.)	DRY GAS METER TEMPERATURE		SOURCE TEMP. (deg F)	PUMP VACUUM (in. Hg gauge)	IMPINGER EXIT GAS TEMP. (deg F)	KOH RECIR. RATE (ml/min)
						INLET (deg F)	OUTLET (deg F)				
A	0	1440			603.6						
	5		49	1.47	607.1	87	85	682	4.0	62	50
	10		49	1.47	610.6	89	85	682	5.5	58	
	15		49	1.47	614.1	89	85	682	7.0	60	
	20		49	1.47	617.7	89	85	682	7.0	62	
	25		49	1.47	621.0	89	85	682	7.0	65	
B	0	1522			624.5						
	5		40	1.20	627.6	87	84	182	4.0	67	50
	10		40	1.20	630.8	89	85	183	5.0	56	
	15		37	1.11	633.9	91	86	183	6.0	54	
	20		36	1.08	637.1	91	86	183	6.0	58	
	25		32	1.06	639.9	93	87	182	5.0	57	
C	0	1552			643.0						
	5		32	1.06	643.0	92	87	183	5.0	59	
	10										
	15										
	20										
	25										
D	0	1852			18.337						
	5				20.751						
	10				20.758						
	15				19.675						
	20										
	25										
E	0	1922									
	5										
	10										
	15										
	20										
	25										
F	0	2052									
	5										
	10										
	15										
	20										
	25										
G	0	2122									
	5										
	10										
	15										
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	25										
H	0	2252									
	5										
	10										
	15										
	20										
	25										
I	0	2322									
	5										
	10										
	15										
	20										
	25										
J	0	2422									
	5										
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K	0	2452									
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L	0	2522									
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M	0	2552									
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N	0	2622									
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P	0	2722									
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Q	0	2752									
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R	0	2822									
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S	0	2852									
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T	0	2922									
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U	0	2952									
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V	0	3022									
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	15										
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	25										
W	0	3052									
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	20										
	25										
X	0	3122									
	5										
	10										
	15										
	20										
	25										
Y	0	3152									
	5										
	10										
	15										
	20										
	25										
Z	0	3222									
	5										
	10										
	15										
	20										
	25										
AA	0	3252									
	5										
	10										
	15										
	20										
	25										
AB	0	3322									
	5										
	10										
	15										
	20										
	25										
AC	0	3352									
	5										
	10										
	15										
	20										
	25										
AD	0	3422									
	5										
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	15										
	20										
	25										
AE	0	3452									
	5										
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	15										
	20										
	25										
AF	0	3522									
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AG	0	3552									
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AH	0	3622									
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AI	0	3652									
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	20										
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AJ	0	3722									
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AK	0	3752									
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	15										
	20										
	25										
AL	0	3822									
	5										
	10										
	15										
	20										
	25										
AM	0	3852									
	5										
	10										
	15										
	20										
	25										
AN	0										

# EPA Cr<sup>+6</sup> Method

## SAMPLE RECOVERY AND INTEGRITY DATA FORM

Plant RMA - SQT Sample Date 6/10/93  
 Sample Location STACK Run Number ONE  
 Sample Recovery Person KH Recovery Date 6/10/93

### MOISTURE

#### Impingers

#### KOH

#### Silica Gel

Final volume (wt) 950 + 950 ml + 880 Final wt 358 g \_\_\_\_\_ g  
 Initial volume (wt) 300 + 180 ml + 75 Initial wt 300 g \_\_\_\_\_ g  
 Net volume (wt) 2255 ml Net wt 58 g \_\_\_\_\_ g  
 Total moisture 2313  
 Color of silica gel PINK / BLUE

#### RECOVERED SAMPLE

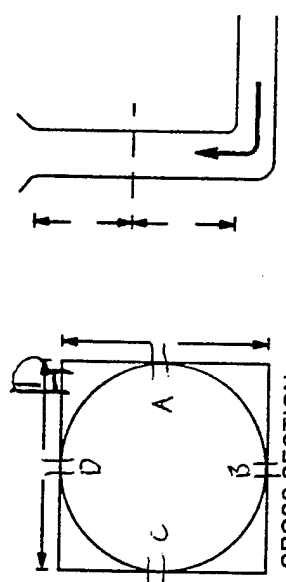
*on millipore filter after filtration*

Description of particulate ✓ LIGHT TO MODERATELY HEAVY  
 KOH impingers and rinse container number(s) RMA-TBURN-CR6-RN1-KOH (4 of 4)  
 Sample Filtered? ✓ Liquid level marked? ✓  
 Blank KOH container number(s) RMA-TBURN-CR6-SB-KOH Liquid level marked? ✓  
 Samples stored and locked ✓  
 Remarks: FINAL PH = 10.5

Date of laboratory custody \_\_\_\_\_  
 Laboratory personnel taking custody \_\_\_\_\_  
 Remarks: \_\_\_\_\_

--.35  
 182  
 29  
 62

CLIENT RMV - SQI  
PLANT SQI  
LOCATION STACK  
OPERATOR ARB  
RUN NO. ONE DATE 6-10-93  
AMBIENT TEMP. (deg F) 65°  
BARO. PRESS. (in Hg) 24.79  
METER BOX NO. 9  
METER BOX ΔH @ 1.903  
METER BOX CAL. (V) 1.001  
PROBE LENGTH (ft) 30"  
PROBE LINER MATERIAL boro  
PROBE HEATER SETTING 22  
K FACTOR 3.48 3.56  
65°



LEAK CHECKS  
PITOT TUBE: INITIAL Good FINAL  
METHOD THREE: INITIAL N/A FINAL

TRAVERSE POINT NUMBER	SAMPLING TIME (min)	24-HOUR CLOCK TIME	VELOCITY HEAD (delta P) (in. H <sub>2</sub> O)	ORIFICE METER PRESSURE DIFFERENTIAL (delta H) (in. H <sub>2</sub> O)	GAS METER READING (cubic ft.)	DRY GAS METER TEMPERATURE	SOURCE TEMP. (deg F)	PUMP VACUUM (in. Hg gauge)	IMPINGER EXIT TEMP. (deg F)	FILTER BOX TEMP. (deg F)
						INLET (deg F)	OUTLET (deg F)			
B	0				377.575					
1	5	0745	0.53	1.84	381.3	64	61	4	64	238
1	10		0.52	1.81	385.2	63	64	4	48	239
2	15		0.58	2.02	389.2	73	65	5	47	238
2	20		0.60	2.09	393.5	76	66	5	48	239
3	25		0.65	2.26	397.8	78	67	5	47	241
3	30	0815	0.64	2.22	402.176	81	69	5	46	241
					406.105 @ 64					
A	0				402.555					
1	5	0830	0.32	1.11	405.5	76	72	4	53	238
1	10		0.32	1.11	408.7	78	73	4	50	238
2	15		0.53	1.89	412.7	82	74	5	47	239
2	20		0.54	1.92	416.7	83	74	5	47	236
3	25		0.58	2.06	421.0	83	75	5	48	237
3	30	0900	0.58	2.06	425.044	83	75	5	49	240
					429.005 @ 64					
	TOTAL		AVG. $\sqrt{\Delta P}$	AVG. $\Delta H$	TOTAL V <sub>m</sub>	AVG. T <sub>m</sub>		MAX. VAC.	MAX. TEMP.	MIN. MAX.
						AVG. T <sub>s</sub>				

COMMENT

**COMMENT**

CLIENT KMA-SOI  
PLANT SOI  
LOCATION STACK

# MULTI METALS FIELD DATA FORM OPERATOR

OPERATOR	ARB
RUN NO.	0106
K FACTOR	3.56

SHEET 2 OF 2

TRAVERSE POINT NUMBER	SAMPLING TIME (min)	24-HOUR CLOCK TIME	VELOCITY HEAD (delta P) (in. H <sub>2</sub> O)	ORIFICE METER PRESSURE DIFFERENTIAL (delta H) (in. H <sub>2</sub> O)	GAS METER READING (cubic ft.)	DRY GAS METER TEMPERATURE		SOURCE TEMP. (deg F)	PUMP VACUUM (in. Hg gauge)	IMPINGER EXIT GAS TEMP. (deg F)	FILTER BOX TEMP. (deg F)
						INLET (deg F)	OUTLET (deg F)				
D	0	0917			425.370						
	5				428.6	77	75	184	4	68	239
	10				431.7	78	75	184	4	51	239
	15				435.4	80	75	185	5	47	240
	20				438.9	82	76	185	5	50	238
	25				442.8	86	77	184	5	52	242
30		0917			446.855	87	77	184	5	51	242
					LC-DK6H <sub>g</sub>						
C	0	1002									
	5				447.078						
	10				450.3	83	80	183	5	68	240
	15				454.0	90	82	183	5	54	240
	20				457.9	94	84	184	5	52	241
	25				461.9	96	85	184	6	54	239
30		1032			466.0	98	86	182	6	51	239
					470.200	97	87	182	6	51	240
					LC-005E <sub>g</sub>						
		</									

COMMEN-

# EPA MULTI-METALS SAMPLE RECOVERY AND INTEGRITY DATA FORM

Plant RMA-SQE Sample Date 6-10-93  
 Sample Location STACK Run Number ONE  
 Sample Recovery Person JPO Recovery Date 6-10-93  
 Filter Number(s) N/A

## MOISTURE

842  
876  
852  
2570

Impingers	HNO <sub>3</sub> /H <sub>2</sub> O <sub>2</sub>	Dry Imp. 3/4	KMnO <sub>4</sub>	Silica Gel
Final vol (wt)	<u>2570</u> ml	<u>319</u> ml	<u>223</u> ml	Final wt <u>323</u> g
Initial vol (wt)	<u>200</u> ml	<u>0</u> ml	<u>200</u> ml	Initial wt <u>300</u> g
Net volume (wt)	<u>2370</u> ml	<u>319</u> ml	<u>23</u> ml	Net wt <u>23</u> g
Total moisture <u>2712 + 23 = 2735</u>				
Color of silica gel <u>ble 20%</u>				
Description of particulate <u>light tan</u>				
Description of impinger water (condensate/HNO <sub>3</sub> ) <u>all clean</u>				

## RECOVERED SAMPLE

### Container #

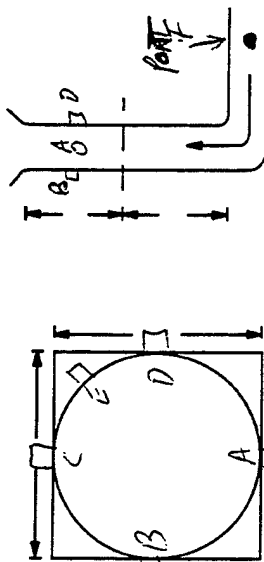
- (3 of 3)
- (1) Filter container number RMA-TBURN-MMTL-RN1-FILT Sealed ☒
  - (2) Front-half acetone container number(s) N/A Liquid level marked? ☐
  - (3) Front-half 0.1N nitric container number (s) RMA-TBURN-MMTL- Liquid level marked? ☒
  - (4) Back-half condensate impingers (1 through 3) and nitric rinse container number(s) RN1-FHN Liquid level marked? ☒
  - (5A) Impinger 4 condensate and nitric rinse container number(s) RMA-TBURN-MMTL-RN1-Imp4 Liquid level marked? ☒
  - (5B) KMnO<sub>4</sub> impingers 5 and 6 and KMnO<sub>4</sub> and water rinse container number(s) RMA-TBURN-MMTL-RN1-KMnO4 Liquid level marked? ☒
  - (5C) 8NHCl rinse (if required) container number RMA-TBURN-MMTL- Liquid level marked? ☒
  - (7) Blank acetone container number N/A - RN1-AC Liquid level marked? ☐
  - (8) Blank 0.1N nitric container number \_\_\_\_\_ Liquid level marked? ☐
  - (9) Blank nitric/H<sub>2</sub>O<sub>2</sub> container number \_\_\_\_\_ Liquid level marked? ☐
  - (10) Blank KMnO<sub>4</sub> container number \_\_\_\_\_ Liquid level marked? ☐
  - (11) Blank 8N HCl container number \_\_\_\_\_ Liquid level marked? ☐
  - (12) Blank Filter container number \_\_\_\_\_ Liquid level marked? ☐

Samples stored and locked JPO - OK  
 Date of laboratory custody 6/11/93  
 Laboratory personnel taking custody \_\_\_\_\_  
 Remarks: \_\_\_\_\_

NOTE: Container (6) is the silica gel.

CLIENT RMA - SQT  
PLANT De Alven Colmaro  
LOCATION State Breaching  
OPERATOR Mills  
RUN NO. ONE DATE 6/20/93  
AMBIENT TEMP. (deg F) 80  
BARO. PRESS. (in Hg) 24.79  
METER BOX NO. 1257-4  
METER BOX ΔH @ 11/1  
METER BOX CAL. (V) 9963  
PROBE LENGTH (ft) 3 FT  
PROBE LINER MATERIAL Borosilicate  
PROBE HEATER SETTING > 150°C  
K FACTOR N/A

## VOST FIELD DATA FORM

CROSS-SECTION  
PLAN OR ELEVATION

## TENAX TUBE SAMPLE NUMBERS

SET ONE RMA-TBUN-MW30-RN1-TP1 (13940)  
SET TWO RMA-TBUN-MW30-RN1-TP2 (13951)  
SET THREE RMA-TBUN-MW30-RN1-TP3 (13942)  
SET FOUR RMA-TBUN-MW30-RN1-TP4 (13941)  
SET FIVE RMA-TBUN-MW30-RN1-TP5 (13944)  
SET SIX RMA-TBUN-MW30-RN1-TP6 (13943)  
STACK BLANK RMA-TBUN-MW30-BT-TP (13935)

RMA-TBUN-MW30-RN1-CAND1-4  
RMA-TBUN-MW30-BT-CAND

LEAK CHECKS SET ONE: Good SET TWO: Good SET THREE: Good SET FOUR: Good SET FIVE: Good SET SIX: Good  
INITIAL: Good FINAL: Good

TRAVERSE POINT NUMBER	SAMPLING TIME (min)	24-HOUR CLOCK TIME	ROTO-METER SETTING	ORIFICE METER PRESSURE DIFFERENTIAL (delta H) (in. H <sub>2</sub> O)	GAS METER READING (liter)	DRY GAS METER TEMPERATURE		PROBE TEMP. (deg C)	PUMP VACUUM (in. Hg gauge)	FIRST CONDENS. EXIT GAS TEMP. (deg C)	SECOND CONDENS. EXIT GAS TEMP. (deg C)
						INLET (deg C)	OUTLET (deg C)				
901 F	0	0808	80	1.4	978.188	N/A	27	180	5	13	13
	5		78	1.5	983.13		28	177	7.5	10	14
	10		78	1.4	988.7		28	175	8.0	9	13
	15		82	1.5	994.5		28	179	9.0	8	13
	20	0828		1.5	1000.550		27.75				
				1.45	22.3628						
	0	0840	80	1.4	01.625	N/A	28	182	6.0	13	13
	5		80	1.5	07.3		29	178	6.5	9	13
	10		82	1.5	12.8		30	202	6.5	10	13
	15		80	1.5	18.13		30	192	6.5	9	13
	20	0900		1.5	24.075		29.25				
				1.475	22.450						
	0	0914	80	1.5	25.455	N/A	30	178	5.0	13	14
	5		80	1.5	31.0		31	184	7.0	10	14
	10		80	1.5	36.7		30	185	7.0	10	12
	15		80	1.5	42.2		31	187	8.0	9	12
	20		80	1.5	47.890						
	TOTAL Ø			AVG. ΔH (1.50)	TOTAL V (22.475)		AVG. T <sub>m</sub> (30.50)	AVG. T <sub>s</sub>	MAX. VAC.	MAX. TEMP.	MAX. TEMP.

COMMENTS: Probe is little clogged before + after Test Run.

CLIENT RMA-SQ I  
PLANT Denver Colorado  
LOCATION \_\_\_\_\_

# VOST FIELD DATA FORM

OPERATOR  
RUN NO.  
K FACTOR

SHEET 2 OF 2  
JACK MILLS  
ONE DATE 6/10/93

SHEET 2 OF 2

TRAVERSE POINT NUMBER	SAMPLING TIME (min)	24-HOUR CLOCK TIME	ROTO-METER SETTING	ORIFICE METER PRESSURE DIFFERENTIAL (in. H <sub>2</sub> O)	GAS METER READING (liters)	DRY GAS METER TEMPERATURE		PROBE TEMP. (deg C)	PUMP VACUUM (in. Hg gauge)	FIRST CONDENS. EXIT GAS TEMP. (deg C)	SECOND CONDENS. EXIT GAS TEMP. (deg C)
						INLET (deg C)	OUTLET (deg C)				
	0	0946			48.945						
	5		82	1.4	54.7	NA	31	183	3.0	13	14
	10		80	1.5	61.6	I	31	179	4.0	9	13
	15		78	1.5	65.8	I	32	182	4.0	9	9
	20	1006	80	1.5	71.395	I	32	185	4.0	9	9
				(1.475)	(20.450)		(31.50)				
	0	1019			72.420						
	5		85	1.5	78.2	NA	32	182	3.0	11	11
	10		83	1.5	83.8	I	32	185	4.0	8	10
	15		80	1.5	89.13	I	32	222	4.0	10	11
	20	1039	78	1.5	94.780	I	32	220	4.0	10	12
				(1.50)	(22.360)		(32.00)				
	0	1059			95.928						
	5		80	1.5	101.5	NA	34	210	3.5	13	13
	10		80	1.5	107.12	I	33	200	5.0	10	12
	15		80	1.5	112.68	I	33	192	5.0	9	11
	20	1109	80	1.5	118.158	I	33	179	5.0	9	11
				(1.50)	(22.230)		(33.25)				
TOTAL θ				AVG. ΔH	TOTAL V <sub>m</sub>	AVG. T <sub>m</sub>	AVG. T <sub>s</sub>	MAX. VAC.	MAX. TEMP.	MAX. TEMP.	

COMMENTS: Condenser recir, water winded at 38°F

# GAS ANALYSIS DATA FORM

Plant: RMA/SQI Sample Location: Stack  
 Date: 10 June 93 Operator: ARIS  
 Sample Type: SINGLE POINT or (MULTIPOINT) GRAB or (INTEGRATED)  
 Analytical Method: ORSAT Orsat Leak Check: Good

Run Number	Sample Location/Train ID	% CO2 Reading 1	%O2		%N2 100 - Reading 2
			Reading 2	Net (1)	
ONE	Stack / Past. / HCl	<del>9.8</del>	<del>14.0</del>	<del>4.2</del>	
ONE	Stack / Past. / HCl	9.2	13.8	4.6	
ONE	Stack / Past. / HCl	9.3	14.3	5.0	
ONE	Stack / Past. / HCl	9.4	14.2	4.5	
ONE	Stack / Past. / HCl	9.2	14.0	4.8	
Average		(9.275)		(4.80)	
ONE A	Stack / semi vol	10.2	13.6	3.4	
		10.0	13.4	3.4	
		10.0	13.5	3.5	
ONE B	Stack / semi vol	<del>10.3</del>	<del>13.2</del>	<del>2.9</del>	
		10.3	13.7	3.4	
		10.2	13.6	3.4	
		10.1	13.6	3.5	
Avg		(10.1)		(3.4)	
ONE	Stack / Cr <sup>+6</sup>	9.0	14.2	5.2	
		8.9	14.5	5.6	
		9.0	14.5	5.5	
AVERAGES		(9.0)		(5.4)	

%N2 = 100 - (%CO2 + %O2 + %CO)  
 MWd = 0.440(%CO2) + 0.320(%O2) + 0.280(%N2 + %CO)

(1) Net %O2 = Reading 1 - Reading 2

Integrated Bag Limits  
 CO2 > 4% - 0.3% by vol  
 <= 4% - 0.2% by vol  
 O2 >= 15% - 0.2% by vol  
 < 15% - 0.3% by vol



[illegible]

**COMMENTS:**

Int lead post B 017015"4

# EPA METHOD 0050 HYDROCHLORIC ACID SAMPLE RECOVERY AND INTEGRITY DATA FORM

Plant RMA - SQT Sample Date 6-11-93  
 Sample Location SWR Run Number 900  
 Sample Recovery Person JPO Recovery Date 6-11-93  
 Filter # 1397

## MOISTURE

### Impingers

	0.1N H <sub>2</sub> SO <sub>4</sub>	0.1N NaOH	Silica Gel	
Final volume (wt)	<u>2764</u> ml	<u>209</u> ml	Final wt <u>320</u> g	<u>892</u>
Initial volume (wt)	<u>250</u> ml	<u>200</u> ml	Initial wt <u>300</u> g	<u>978</u>
Net volume (wt)	<u>2514</u> ml	<u>9</u> ml	Net wt <u>20</u> g	<u>894</u>
Total moisture	<u>2543</u>			<u>2764</u>
Color of silica gel	<u>NA</u>			
Description of impinger water	<u>clear - all</u>			

Front half acetate RECOVERED SAMPLE  
 Filter container # RMA - TB0100 - M0050 - AN2 - F11A ✓  
 Blank 0.1N H<sub>2</sub>SO<sub>4</sub> container number RMA - TB0100 - M0050 - RN2 - FILT ✓ Sealed  
 Blank 0.1N NaOH container number \_\_\_\_\_ Sealed  
 Blank distilled water container number \_\_\_\_\_ Sealed

Description of particulate on filter \_\_\_\_\_

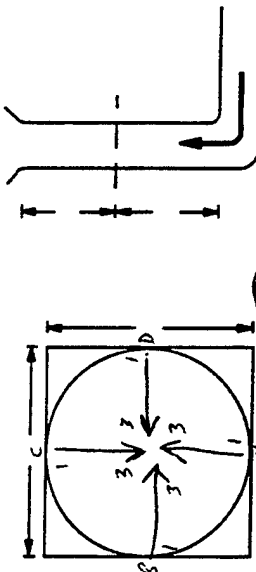
0.1N H<sub>2</sub>SO<sub>4</sub> Impingers container number RMA - TB0100 - M0050 - RN2 - H<sub>2</sub>SO<sub>4</sub> Liquid level marked? ✓  
 0.1N NaOH Impingers container number RMA - TB0100 - M0050 - RN2 - NaOH Liquid level marked? ✓  
 Samples stored and locked \_\_\_\_\_  
 Remarks: TSU 2,900 ml

Date of laboratory custody \_\_\_\_\_  
 Laboratory personnel taking custody \_\_\_\_\_  
 Remarks: \_\_\_\_\_

1000  
1000

CLIENT RMA  
 PLANT SGI  
 LOCATION Stack  
 OPERATOR Fritz  
 RUN NO. 160 DATE 6/11/93  
 AMBIENT TEMP. (deg F) 70  
 BARO. PRESS. (in Hg) 24.57  
 METER BOX NO. 15  
 METER BOX ΔH @ 2.01  
 METER BOX CAL. (V) .9954  
 PROBE LENGTH (ft) 30"  
 PROBE LINER MATERIAL Barosilicate  
 PROBE HEATER SETTING 25  
 K FACTOR 2.87, 2.92

**EPA METHOD 0010 FIELD DATA FORM**



CROSS SECTION Circular PLAN OR ELEVATION

LEAK CHECKS

PITOT TUBE: INITIAL Good FINAL Good

METHOD THREE: INITIAL Good FINAL Good

PITOT TUBE IDENTIFICATION NO. 164  
 PITOT TUBE CAL. FACTOR (C<sub>p</sub>) .87  
 NOZZLE IDENTIFICATION NO. 6455 355  
 AVG. NOZZLE DIAMETER (D), in. .355  
 PYROMETER IDENTIFICATION NO. 15  
 THERMOCOUPLE IDENTIFICATION NO. ---  
 ASSUMED MOISTURE, % 63  
 ASSUMED TEMPERATURE, deg F 183  
 STATIC PRESSURE (P<sub>static</sub>), in H<sub>2</sub>O -.15  
 INITIAL LEAK RATE .010 @ 15 in Hg  
 MID-POINT LEAK RATE .011 @ 15 in Hg  
 FINAL LEAK RATE .008 @ 13 in Hg  
 XAD NO. see REC sheet

TRAVERSE POINT NUMBER	SAMPLING TIME (min)	24-HOUR CLOCK TIME	VELOCITY HEAD (delta P) (in. H <sub>2</sub> O)	ORIFICE METER PRESSURE DIFFERENTIAL (delta H) (in. H <sub>2</sub> O)	GAS METER READING (cubic ft.)	DRY GAS METER TEMPERATURE INLET (deg F) OUTLET (deg F)	SOURCE TEMP. (deg F)	PUMP VACUUM (in. Hg gauge)	IMPINGER EXIT GAS TEMP. (deg F)	FILTER BOX TEMP. (deg F)	XAD INLET TEMP. (deg F)
0	0	0710			369.262	63 63	184	4.0	65 243	257	65
1	5		.37	1.06	372.12	63 63	184	4.5	48 241	257	60
1	10		.37	1.06	375.06	65 64	184	5.0	48 240	256	63
1	15		.37	1.06	378.19	68 65	184	5.0	50 240	257	66
1	20		.39	1.12	381.24	69 65	185	5.5	50 241	256	62
2	25		.43	1.23	384.46	70 66	185	5.5	48 242	256	63
2	30		.44	1.26	387.63	73 67	184	6.0	47 243	257	65
2	35		.44	1.26	390.88	75 69	184	6.0	47 246	257	66
2	40		.44	1.26	393.98	76 70	185	8.0	46 246	255	64
3	45		.58	1.67	397.70	78 72	184	8.5	49 243	257	65
3	50		.56	1.61	401.39	81 74	183	8.5	49 239	256	64
3	55		.54	1.55	405.06	82 75	184	8.5	48 238	255	65
3	60	0810	.51	1.46	408.627	83 77					
					Leak Check .011 at 14" Hg						
	0	0841			408.975						
1	5		.40	1.15	411.95	76 76	184	7.5	67 249	258	66
1	10		.37	1.06	415.18	81 78	184	7.5	48 235	246	64
1	15		.37	WE 4.08 1.08	418.19	82 79	185	7.5	45 239	231	63
	TOTAL		AVG. ΔP	AVG. ΔH	TOTAL V <sub>m</sub>	AVG. T <sub>m</sub>	AVG. T <sub>s</sub>	MAX. VAC.	MAX. TEMP.	MIN. MAX.	MAX. TEMP.

COMMENTS:



CLIENT RITA  
PLANT SOI  
LOCATION Stack

EPA METHOD 0010 FIELD DATA FORM

OPERATOR Fritz

RUN NO. Two DATE 6/11/93  
K FACTOR 2.93

TRAVERSE POINT NUMBER	SAMPLING TIME (min)	24-HOUR CLOCK TIME	VELOCITY HEAD (delta P) (in. H <sub>2</sub> O)	ORIFICE METER PRESSURE DIFFERENTIAL (in. H <sub>2</sub> O)	GAS METER READING (cubic ft.)	DRY GAS METER TEMPERATURE		SOURCE TEMP. (deg F)	PUMP VACUUM (in. Hg gauge)	IMPINGER EXIT GAS TEMP. (deg F)	FILTER BOX TEMP. (deg F)	XAD INLET TEMP. (deg F)
						INLET (deg F)	OUTLET (deg F)					
1	20		.37	1.08	421.25	85	81	185	7.5	48	245	65
2	25		.52	1.52	424.69	85	82	185	10.0	45	245	66
2	30		.49	1.43	428.25	86	82	184	11.0	47	256	67
2	35		.52	1.52	431.77	85	82	183	10.5	49	242	60
2	40		.49	1.43	435.24	85	82	183	10.5	47	240	62
3	45	*0926	.58	1.69	438.918/431.275	86	83	185	13.0	49	241	62
3	50		.59	1.72	443.01	85	84	186	6.0	53	244	55
3	55		.60	1.75	446.85	83	82	182	6.0	43	241	58
3	60	0958	.57	1.66	450.630	87	84	184	6.0	44	238	58
					Leak check	.011 at 15" Hg						
	0	1026			450.913							
1	5		.47	1.37	454.16	79	79	182	5.0	59	255	58
1	10		.49	1.43	457.64	80	79	184	5.0	51	241	58
1	15		.48	1.40	460.90	82	80	184	5.0	49	232	64
1	20		.47	1.37	464.54	84	81	184	5.0	48	252	64
2	25		.53	1.55	468.17	85	81	184	6.0	49	256	65
2	30		.56	1.64	471.82	84	80	183	6.5	49	244	64
2	35		.58	1.69	475.63	84	81	184	7.0	51	238	62
2	40		.55	1.61	479.39	87	84	184	7.0	53	240	64
3	45		.60	1.75	483.21	88	84	184	7.5	57	242	66
3	50	*1117	.62	1.81	487.18	86	82	182	8.0	58	242	67
3	55		.63	1.84	491.12	86	83	184	8.5	58	238	65
3	60	1127	.63	1.84	494.967	88	84	184	9.0	58	243	65
					Leak check	.009 at 12" Hg						
	0	1158			495.262							
1	5		.45	1.31	498.59	84	82	182	6.5	65	232	66
1	10		.42	1.23	501.92	86	84	182	6.5	46	236	56
1	15		.43	1.26	505.25	84	83	183	6.5	49	235	57
	TOTAL		AVG. $\sqrt{\Delta P}$	AVG. $\Delta H$	TOTAL V <sub>m</sub>	AVG. T <sub>m</sub>		AVG. T <sub>s</sub>	MAX. VAC.	MAX. TEMP.	MIN. MAX.	MAX. TEMP.

COMMENTS: \*0926 Stop test, filter change, Leak check .014 at 15" Hg. Restart 0943, 439.275. \*1117 power stopped back running at 1119

CLIENT EMT  
PLANT S&I  
LOCATION Sher

SHEET 3 OF 3

## EPA METHOD 0010 FIELD DATA FORM

## OPERATOR

Fritz

**RUN NO.**

Two

DATE 6/11/93

LOCATION 5 Jack

TRVERSE SAMPLING

## K FACTOR

2,92

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[illegible]

**COMMENTS:**

g:\shared\airteam\forms\0010FDF2.DRW

## EPA METHOD 0010

## SAMPLE RECOVERY AND INTEGRITY DATA FORM

Plant RMA - JQI Sample Date 6-11-93  
 Sample Location JQI Run Number 7200  
 Sample Recovery Person JPD Recovery Date 6-11-93

## MOISTURE

4902 Impingers Condensor Silica Gel  
 868 Final volume (wt) 4956 ml Final wt 351 g  
 520 Initial volume (wt) 200 ml XAD-152 ml Initial wt 300 g  
 937 Net volume (wt) 4757 ml Net wt 51 g  
 907 Total moisture 4757 + 15 + 51 = 4822  
 822 Color of silica gel 4772  
 Description of impinger water clean

## RECOVERED SAMPLE

Blank Filter container number \_\_\_\_\_ Sealed \_\_\_\_\_  
 Blank XAD container number \_\_\_\_\_ Sealed \_\_\_\_\_  
 Filter/XAD container number RMA-TBORN-MOOD-RN2-FILT Sealed ☒  
 Filter/XAD container number RMA-TBORN-MOOD-RN2-XAD Sealed ☒  
 Filter/XAD container number \_\_\_\_\_ Sealed \_\_\_\_\_  
 Filter/XAD container number \_\_\_\_\_ Sealed \_\_\_\_\_  
 Description of particulate on filter \_\_\_\_\_  
 Condenser water container number RMA-TBORN-MOOD-RN2 Liquid level marked? ☒  
 Front-half solvent COND  
 rinse container number RMA-TBORN-MOOD-RN2-FRS Liquid level marked? ☒  
 Impinger contents and back-half COND  
 water rinse container number RMA-TBORN-MOOD-RN2-COND Liquid level marked? ☒  
 Back-half solvent COND  
 rinse container number RMA-TBORN-MOOD-RN2-BHS Liquid level marked? ☒  
 Water blank container number \_\_\_\_\_ Liquid level marked? \_\_\_\_\_  
 Solvent blank container number \_\_\_\_\_ Liquid level marked? \_\_\_\_\_

Samples stored and locked ☒ OK JPD

Remarks: \_\_\_\_\_

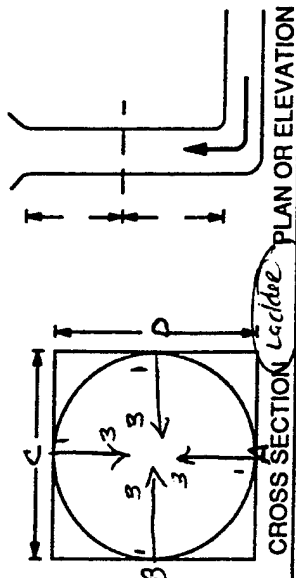
Date of laboratory custody \_\_\_\_\_

Laboratory personnel taking custody \_\_\_\_\_

Remarks: EPA 0010 blank filter setup for JPD  
run 2 - recovered along with source samples.

CLIENT RMA - SQT  
 PLANT SQT  
 LOCATION STACK  
 OPERATOR D. CARLO  
 RUN NO. 1200 DATE 6-11-93  
 AMBIENT TEMP. (deg F) 85  
 BARO. PRESS. (in Hg) 29.57  
 METER BOX NO. 12  
 METER BOX ΔH @ 2.012  
 METER BOX CAL. (V) 1.010  
 PROBE LENGTH (ft) 30"  
 PROBE LINER MATERIAL BOLO3/1/CAK  
 PROBE HEATER SETTING 250 F25  
 K FACTOR 2.00

## EPA METHOD 23 FIELD DATA FORM



CROSS SECTION Leak PLAN OR ELEVATION

LEAK CHECKS  
 PITOT TUBE: INITIAL 606V FINAL 600D  
 METHOD THREE: INITIAL 600V FINAL 600D

PITOT TUBE IDENTIFICATION NO. P52  
 PITOT TUBE CAL. FACTOR (C<sub>a</sub>) 1.840  
 NOZZLE IDENTIFICATION NO. 1060 355  
 AVG. NOZZLE DIAMETER (D), in. 0.355  
 PYROMETER IDENTIFICATION NO. 102  
 THERMOCOUPLE IDENTIFICATION NO. 102  
 ASSUMED MOISTURE, % 62%  
 ASSUMED TEMPERATURE, deg F 181  
 STATIC PRESSURE (P<sub>static</sub>), in H<sub>2</sub>O 1.13  
 INITIAL LEAK RATE 0.028 @ 15 in Hg  
 MID-POINT LEAK RATE 0.028 @ 8 in Hg  
 FINAL LEAK RATE 0.028 @ 16 in Hg  
 XAD NO. 12/14 sec Rec. 5 Dec

TRAVERSE POINT NUMBER	SAMPLING TIME (min)	24-HOUR CLOCK TIME	VELOCITY HEAD (delta P) (in. H <sub>2</sub> O)	ORIFICE METER PRESSURE DIFFERENTIAL (in. H <sub>2</sub> O)	GAS METER READING (cubic ft.)	DRY GAS METER TEMPERATURE INLET (deg F) OUTLET (deg F)	SOURCE TEMP. (deg F)	PUMP VACUUM (in. Hg gauge)	IMPINGER EXIT GAS TEMP. (deg F)	FILTER BOX TEMP. (deg F)	XAD INLET TEMP. (deg F)
0	0	7:10			621.981						
1	5		1.42	1.26	625.24	64 63	183	4.0	56 258	252	57
1	10		1.42	1.26	628.55	67 64	183	4.0	49 246	253	66
1	15		1.43	1.29	631.90	69 65	183	4.5	45 241	253	66
1	20		1.47	1.42	635.39	70 65	183	5.0	43 239	254	61
2	25		1.50	1.45	639.15	73 67	184	5.5	42 239	254	66
2	30		1.48	1.45	642.78	76 69	186	5.5	45 241	256	66
2	35		1.49	1.48	646.34	77 70	183	5.5	44 241	254	64
2	40		1.50	1.51	650.0	78 71	183	5.5	45 242	258	66
3	45		1.67	2.02	654.01	80 73	184	7.0	46 239	252	66
3	50		1.63	1.99	658.21	82 74	184	7.0	46 237	248	66
3	55		1.64	1.96	662.28	83 75	183	7.0	48 236	251	67
3	60	8:10	1.59	1.81	666.33	82 75	183	7.5	47 237	251	67
					LEAK CHECK OK @ 0.012 @ 9" Hg						
7001B	0	8:41			666.720						42
1	5		1.50	1.54	670.39	77 77	183	7.0	65 235	247	42
1	10		1.50	1.54	674.135	80 77	183	7.0	46 235	247	59
1	15		1.49	1.50	677.85	82 78	183	7.0	46 238	248	61
	TOTAL		AVG. ΔP	AVG. ΔH	TOTAL V <sub>m</sub>	AVG. T <sub>m</sub>	AVG. T <sub>s</sub>	MAX. VAC.	MAX. TEMP.	MIN. MAX.	MAX. TEMP.

COMMENTS:



CLIENT BMA-SOI  
PLANT SOI  
LOCATION STACK

# EPA METHOD 23 FIELD DATA FORM

OPERATOR D'CARLO SHEET 2 OF 3  
RUN NO. 720 DATE 6-11-82  
K FACTOR 3.07 3.10

TRAVERSE POINT NUMBER	SAMPLING TIME (min)	24-HOUR CLOCK TIME	VELOCITY HEAD (delta P) (in. H <sub>2</sub> O)	ORIFICE METER PRESSURE DIFFERENTIAL (in. H <sub>2</sub> O)	GAS METER READING (cubic ft.)	DRY GAS METER TEMPERATURE		SOURCE TEMP. (deg F)	PUMP VACUUM (in. Hg gauge)	IMPINGING EXIT GAS TEMP. (deg F)	FILTER BOX TEMP. (deg F)	XAD INLET TEMP. (deg F)
						INLET (deg F)	OUTLET (deg F)					
1	20		1.54	677.85	81	78	183	3.0	46	240	248	62
2	25		1.75	681.44	82	79	184	10.0	47	241	248	62
2	30		1.75	685.35	84	80	184	10.0	48	244	250	67
2	35		1.75	689.17	82	79	182	11.0	47	243	249	61
2	40		1.75	693.03	81	79	183	12.0	46	242	249	62
3	45	*	1.66	696.81	83	80	184	13.0	48	243	247	66
3	50		1.69	700.49	81	81	184	5.5	48	268	246	53
3	55		2.06	705.275	83	81	183	10.0	48	225	249	66
3	60	9:58	1.90	709.55	83	81	183	6.0	49	225	246	65
OK LEAK CHECK @ 8:11:10												
PORT A	0	10:26		714.104								
1	5		1.32	717.58	81	80	183	4.5	65	252	247	66
1	10		1.35	721.09	82	80	183	4.5	49	230	245	66
1	15		1.32	724.61	83	80	184	4.5	48	234	246	61
1	20		1.23	728.01	86	82	184	4.0	51	240	248	64
2	25		1.43	731.58	88	83	184	4.5	52	245	247	63
2	30		1.52	735.89	86	83	184	5.0	49	241	247	61
2	35		1.64	739.17	87	83	184	5.0	48	240	248	63
2	40		1.52	742.90	87	83	183	5.0	50	238	247	64
3	45		1.67	746.76	84	82	183	5.0	49	233	246	58
3	50		1.67	750.60	85	82	183	5.0	49	239	246	55
3	55		1.67	754.40	86	83	183	5.5	51	239	251	53
3	60	11:26	1.67	758.246	84	83	184	6.0	53	239	247	52
LEAK CHECK @ 8:11:10												
PORT D	0	11:58		758.547								
1	5		.99	761.59	85	84	184	4.0	65	225	251	48
1	10		.99	764.65	86	84	184	4.5	51	229	251	48
1	15		1.02	767.77	84	84	183	5.0	49	225	249	49
	TOTAL		AVG. ΔP	TOTAL V <sub>m</sub>	AVG. T <sub>m</sub>	AVG. T <sub>s</sub>	MAX. VAC.	MAX. TEMP.	MIN.	MAX.	TEMP.	

COMMENTS: \* about 9:28 @ 45 Torr. 490 leak @ 8:11:10

COMMENTS: Stop at 9:28 @ 45 100.490 leak check OK @ 14:11 @ 0.016 Stack @ 701.154 @ 9.43

TRAVERSE POINT NUMBER	SAMPLING TIME (min)	24-HOUR CLOCK TIME	VELOCITY HEAD (delta P) (in. H <sub>2</sub> O)	ORIFICE METER PRESSURE DIFFERENTIAL (delta H) (in. H <sub>2</sub> O)	GAS METER READING (cubic ft.)	DRY GAS METER TEMPERATURE		SOURCE TEMP. (deg F)	PUMP VACUUM (in. Hg gauge)	IMPINGER EXIT GAS TEMP. (deg F)	FILTER BOX TEMP. (deg F)	XAD INLET TEMP. (deg F)
						INLET (deg F)	OUTLET (deg F)					
1	70		.33	1.07	767.77	83	83	183	5.0	62	249	49
2	25		.35	1.08	770.89	84	83	183	5.0	54	247	49
2	30		.41	1.27	774.03	85	84	184	6.5	55	248	49
2	33		.35	1.08	777.46	85	84	184	6.5	55	247	50
2	40		.48	1.24	780.51	86	84	184	6.5	54	248	51
3	45		.49	1.52	783.82	85	83	183	10.0	52	247	55
3	50		.46	1.43	787.49	85	84	183	11.5	53	249	58
3	55		.43	1.33	790.03	84	83	183	13.0	54	245	59
3	60	12.58	.41	1.27	794.23	85	84	183	14.0	57	246	59
					796.789							
TOTAL	240		AVG. ΔP .696	AVG. ΔH 1.5056	TOTAL V <sub>m</sub> 173.104	AVG. T <sub>m</sub> 80.05	AVG. T <sub>s</sub> 183.458	MAX. VAC. 14.0	MAX. TEMP. 269	MIN. ΔT 245	MAX. TEMP. 258	MAX. TEMP. 607

COMMENTS:

**COMMENTS:**



EPA METHOD 23 (PCDD/PCDF)  
SAMPLE RECOVERY AND INTEGRITY DATA FORM

Plant RMA - JQE Sample Date 6-11-93  
Sample Location SDU Run Number TW0  
Sample Recovery Person JDR Recovery Date 6-11-93

MOISTURE

66  
486  
887  
898  
945  
371  
5053

<u>Impingers</u>		<u>Silica Gel</u>	
Final volume (wt)	<u>5053</u> ml	Final wt	<u>341</u> g
Initial volume (wt)	<u>200</u> ml	Initial wt	<u>300</u> g
Net volume (wt)	<u>4853</u> ml	Net wt	<u>41</u> g
Total moisture <u>4853 + 20 + 41 = 4914</u>			
Color of silica gel <u>10% blue</u>			
Description of impinger water <u>all clear</u>			

RECOVERED SAMPLE

Blank Filter container number \_\_\_\_\_ Sealed \_\_\_\_\_  
Filter container number RMA-TBORN-123-RN2-FILT Sealed ☒  
Blank XAD container number \_\_\_\_\_ Sealed \_\_\_\_\_  
XAD container number RMA-TBORN-123-RN2-XAD Sealed ☒  
Description of particulate on filter \_\_\_\_\_  
Front-half acetone rinse container number RMA-TBORN-123-RN2-FHS Liq. lev. marked? ☒  
Front-half methylene chloride rinse container number " Liq. lev. marked? \_\_\_\_\_  
Back-half water container number RMA-TBORN-123-RN2-COWD Liq. lev. marked? ☒  
Back-half methylene chloride solution rinse RMA-TBORN-123-RN2-BHS Liq. lev. marked? ☒  
Toluene QA / QC rinse RMA-TBORN-RN2-123-TOL Liq. lev. marked? ☒  
Blank distilled water container number \_\_\_\_\_ Liq. lev. marked? \_\_\_\_\_  
Blank acetone container number \_\_\_\_\_ Liq. lev. marked? \_\_\_\_\_  
Blank methylene choride container number \_\_\_\_\_ Liq. lev. marked? \_\_\_\_\_  
Samples stored and locked ☒ 300  
Remarks: \_\_\_\_\_

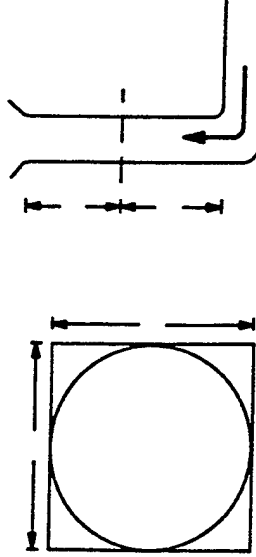
Date of laboratory custody \_\_\_\_\_  
Laboratory personnel taking custody \_\_\_\_\_  
Remarks: \_\_\_\_\_



SHEET 1 OF 2

CLIENT KMA  
PLANT SOI  
LOCATION STACK  
OPERATOR W  
RUN NO. 120 DATE 6/11/93  
AMBIENT TEMP. (deg F) 85  
BARO. PRESS. (in Hg) 29.57  
METER BOX NO. NUTEC 9  
METER BOX ΔH @ 1,902  
METER BOX CAL. (V) 1,001  
PROBE LENGTH (ft) 3  
PROBE LINER MATERIAL TEFLON  
PROBE HEATER SETTING N/A  
K FACTOR 2.77 87.73 103.73

## Cr +6 FIELD DATA FORM

CROSS SECTION  
PLAN OR ELEVATION

LEAK CHECKS

PITOT TUBE: INITIAL N/A FINAL N/AMETHOD THREE: INITIAL N/A FINAL N/A

PITOT TUBE IDENTIFICATION NO. P53  
PITOT TUBE CAL. FACTOR (C<sub>p</sub>) 1.84  
NOZZLE IDENTIFICATION NO. 2216 355A  
AVG. NOZZLE DIAMETER (D), in 1.354  
PYROMETER IDENTIFICATION NO. NUTEC 9  
THERMOCOUPLE IDENTIFICATION NO. 63  
ASSUMED MOISTURE, % 63  
ASSUMED TEMPERATURE, deg F 163  
STATIC PRESSURE (P<sub>static</sub>), in H<sub>2</sub>O -120  
INITIAL LEAK RATE 1.039 @ 15 in Hg  
MID-POINT LEAK RATE 1.004 @ 12 in Hg  
FINAL LEAK RATE 1.004 @ 12 in Hg

TRAVERSE POINT NUMBER	SAMPLING TIME (min)	24-HOUR CLOCK TIME	VELOCITY HEAD (delta P) (in. H <sub>2</sub> O)	ORIFICE METER PRESSURE DIFFERENTIAL (delta H) (in. H <sub>2</sub> O)	GAS METER READING (cubic ft.)	DRY GAS METER TEMPERATURE		SOURCE TEMP. (deg F)	PUMP VACUUM (in. Hg gauge)	IMPINGER EXIT GAS TEMP. (deg F)	KOH REGR. RATE (ml/min)
						INLET (deg F)	OUTLET (deg F)				
C	0	1034			563.353	81	81	182	5.0	67	50
	5		156	1.33	566.8	86	82	183	5.0	56	
	10		154	1.49	570.4	89	83	184	5.0	59	
	15		150	1.39	574.0	89	83	183	5.0	61	
	20		149	1.36	577.3	89	83	183	5.0	65	
D	25	1104	146	1.27	580.9	90	84	182	5.0	66	
	30		146	1.27	584.209						
	0	1111		LC	400 @ 10" Hg						
	5		149	1.36	587.7	85	84	182	6.0	66	50
	10		149	1.26	591.0	87	85	183	6.0	63	
	15		143	1.19	594.3	87	84	183	6.0	60	
	20		143	1.19	597.5	87	84	183	6.0	60	
	25		138	1.27	600.3	88	84	183	7.0	64	
	30	1141	138	1.05	603.715	88	85	184	7.0	64	
				LC	400 @ 10" Hg						
TOTAL Δ			AVG. ΔP	AVG. ΔH	TOTAL V <sub>m</sub>	AVG. T <sub>m</sub>		AVG. T <sub>s</sub>	MAX. VAC.	MAX. TEMP.	

COMMENTS:

\* LC WAS GOOD coming out of port D however, after move to port A, FLOW WENT TIGHTENED TO PALS BACK SILENCE.



CLIENT QMA - SQI  
PLANT SQI  
LOCATION STACK

# Cr +6 FIELD DATA FORM

OPERATOR K4  
RUN NO. 120  
K FACTOR

SHEET 2 OF 2  
DATE 6/11/93

TRAVERSE POINT NUMBER	SAMPLING TIME (min)	24-HOUR CLOCK TIME	VELOCITY HEAD (delta P) (in. H <sub>2</sub> O)	ORIFICE METER PRESSURE DIFFERENTIAL (delta H) (in. H <sub>2</sub> O)	GAS METER READING (cubic ft.)	DRY GAS METER TEMPERATURE		SOURCE TEMP. (deg F)	PUMP VACUUM (in. Hg gauge)	IMPINGER EXIT GAS TEMP. (deg F)	KOH RECI. RATE (ml/min)
						INLET (deg F)	OUTLET (deg F)				
A	0	1209			605.116						
	5		156	1.55	608.4	84	84	181	6.0	66	50
	10		156	1.55	612.1	84	84	182	7.0	59	
	15		148	1.33	615.3	84	85	182	9.0	68	
	20		146	1.27	618.7	89	84	182	9.0	63	
	25		141	1.14	621.9	89	85	183	9.0	66	
B	30	1239	142	1.16	625.002	90	85	182	9.0	67	
	0	1311			627.09	10" Hg					
	5		160	1.66	631.0	87	86	172	7.0	66	50
	10		160	1.66	634.5	90	86	172	9.0	57	
	15		148	1.33	637.9	91	85	181	9.0	54	
	20		145	1.25	641.3	93	86	182	9.0	56	
	25		145	1.25	644.8	92	86	182	9.0	58	
	30	1341	141	1.14	647.842	92	86	182	9.5	62	
					20.823						
					19.886						
					20.856			62.192 M			
					20.856			ACPM 30900			
					19.323			SUPPLY 7700			
								Vm 64.45			
	TOTAL		AVG. VAP. 168943	AVG. ΔH 1.325	TOTAL V. 80.888	AVG. T. 86.3		AVG. T. 182.4	MAX. VAC.	MAX. TEMP.	
	120										

COMMENTS:

FINAL P4 = 9.0

LC GOOD

coming out of port A. However, after more

**EPA Cr<sup>6</sup> Method  
SAMPLE RECOVERY AND INTEGRITY DATA FORM**

Plant RMA - SQI Sample Date 6/11/93  
 Sample Location STACK Run Number TWO  
 Sample Recovery Person KW Recovery Date 6/11/93

**MOISTURE**

**Impingers**

**KOH**

**Silica Gel**

Final volume (wt)	<u>950 + 950 ml + 905</u>	Final wt	<u>367</u> g	_____ g
Initial volume (wt)	<u>300 + 150 ml + 75</u>	Initial wt	<u>300</u> g	_____ g
Net volume (wt)	<u>2280 ml</u>	Net wt	<u>67</u> g	_____ g
Total moisture	<u>2347</u>			
Color of silica gel	<u>PINK / BLUE</u>			

**RECOVERED SAMPLE**

Description of particulate LIGHT TO MODERATELY HEAVY  
 KOH impingers and rinse container number(s) RMA - TBURN - CR6 - RN2 - KOH (4 of 4)  
 Sample Filtered? ✓ Liquid level marked? ✓  
 Blank KOH container number(s) RMA - TBURN - CR6 - SB - KOH Liquid level marked? ✓  
 Samples stored and locked ✓  
 Remarks: FINAL pH = 9.0

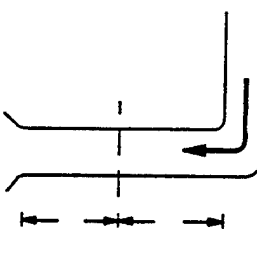
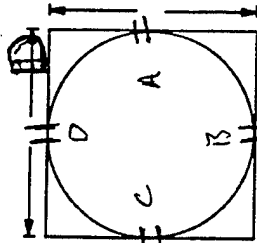
Date of laboratory custody \_\_\_\_\_  
 Laboratory personnel taking custody \_\_\_\_\_  
 Remarks: \_\_\_\_\_



STAT TEMP - 62.5  
MET TEMP - 75  
SHEET 1 OF 2

CLIENT RMH-SQI  
PLANT SQI  
LOCATION Spokane  
OPERATOR BARBER  
RUN NO. 720 DATE 6-11-93  
AMBIENT TEMP. (deg F) 67°  
BARO. PRESS. (in Hg) 24.57  
METER BOX NO. 9  
METER BOX/HAZ@ 1.902  
METER BOX CAL. (Y) 1.001  
PROBE LENGTH (in) 30"  
PROBE LINER MATERIAL BORE  
PROBE HEATER SETTING 2.2  
K FACTOR 3.46 3.53

# MULTI METALS FIELD DATA FORM



CROSS SECTION

PLAN OR ELEVATION

LEAK CHECKS

PITOT TUBE: INITIAL OK FINAL OK  
METHOD THREE: INITIAL OK FINAL OK

PITOT TUBE IDENTIFICATION NO. 8-30  
PITOT TUBE CAL. FACTOR (C<sub>p</sub>) 0.840  
NOZZLE IDENTIFICATION NO. BORE 0.375  
AVG. NOZZLE DIAMETER (D), in. 0.375  
PYROMETER IDENTIFICATION NO. #9  
THERMOCOUPLE IDENTIFICATION NO. #1  
ASSUMED MOISTURE, % 62  
ASSUMED TEMPERATURE, deg F 181  
STATIC PRESSURE (P<sub>static</sub>), in H<sub>2</sub>O 1.5 in Hg  
INITIAL LEAK RATE 0.15 @ 1.5 in Hg  
MID-POINT LEAK RATE 0.05 @ 1.5 in Hg  
FINAL LEAK RATE 0.05 @ 1.5 in Hg  
FILTER NO. 12/14

TRAVERSE POINT NUMBER	SAMPLING TIME (min)	24-HOUR CLOCK TIME	VELOCITY HEAD (delta P) (in. H <sub>2</sub> O)	ORIFICE METER PRESSURE DIFFERENTIAL (delta H) (in. H <sub>2</sub> O)	GAS METER READING (cubic ft.)	DRY GAS METER TEMPERATURE		SOURCE TEMP. (deg F)	PUMP VACUUM (in. Hg gauge)	IMPINGER EXIT GAS TEMP. (deg F)	FILTER BOX TEMP. (deg F)
						INLET (deg F)	OUTLET (deg F)				
B	0	0710	0.37	1.28	470.720	67	66	185	3	65	242
	15		0.38	1.31	473.9	73	68	185	4	57	241
	30		0.50	1.73	481.2	75	68	185	4	53	244
	45		0.55	1.90	485.2	79	69	186	4	49	244
	60		0.60	2.08	489.5	82	71	186	5	50	245
A	0	0740	0.60	2.08	493.765	85	72	185	5	51	244
	15				494.000						
	30				494.000						
	45				494.000						
	60				494.000						
	0	0757	0.45	1.56	501.4	79	74	182	4	61	242
	15		0.45	1.56	501.4	83	75	183	4	54	244
	30		0.47	1.63	505.1	86	78	183	4	57	244
	45		0.48	1.64	508.9	88	79	184	5	57	244
	60		0.56	1.98	512.8	89	80	183	5	61	246
	0	0827	0.53	1.87	516.852	90	80	183	5	64	245
	15										
	30										
	45										
	60										
TOTAL			AVG. $\sqrt{\Delta P}$	AVG. $\Delta H$	TOTAL V <sub>m</sub>	AVG. T <sub>m</sub>		AVG. T <sub>s</sub>	MAX. VAC.	MAX. TEMP.	MIN. MAX.

COMMENT

CLIENT 2MA 597  
PLANT 597  
LOCATION 597


 MULTI METALS FIELD DATA FORM OPERATOR  
 RUN NO. \_\_\_\_\_  
 K FACTOR \_\_\_\_\_

SHEET 2 OF 2  
DATE 6-11-88

OPERATOR 134020000  
RUN NO. 700  
K FACTOR 3.53

## DATA FORM

**WALKER**  
ALL TRADES AND  
CE 6-8-92 MC-CO-004-11A-1

**ALS FIELD**

## MULTI MET

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1575

CLIENT 2pm  
PLANT 5Q  
LOCATION \_\_\_\_\_

21

[illegible]

**COMMENTS**

# EPA MULTI-METALS SAMPLE RECOVERY AND INTEGRITY DATA FORM

Plant RMA - JQT Sample Date 6-11-93  
 Sample Location JQT Run Number R20  
 Sample Recovery Person JDO Recovery Date 6-11-93  
 Filter Number(s) W/A

## MOISTURE

Impingers	HNO <sub>3</sub> /H <sub>2</sub> O <sub>2</sub>	Dry Imp. 3/4	KMNO <sub>4</sub>	Silica Gel
Final vol (wt) <u>2503</u> ml	<u>290</u> ml	<u>222</u> ml	Final wt <u>321</u> g	
Initial vol (wt) <u>200</u> ml	<u>0</u> ml	<u>200</u> ml	Initial wt <u>300</u> g	
Net volume (wt) <u>2303</u> ml	<u>290</u> ml	<u>22</u> ml	Net wt <u>21</u> g	
Total moisture <u>2615 + 21 = 2636</u>				
Color of silica gel <u>slight yellow dirt on filter</u>				
Description of particulate <u>all clear</u>				
Description of impinger water (condensate/HNO <sub>3</sub> ) <u>all clear</u>				

## RECOVERED SAMPLE

### Container #

- (1) Filter container number \_\_\_\_\_ Sealed \_\_\_\_\_
- (2) Front-half acetone container number(s) N/A Liquid level marked? \_\_\_\_\_
- (3) Front-half 0.1N nitric container number (s) RMA-TURN-MMTL Liquid level marked? ✓
- (4) Back-half condensate impingers (1 through 3) and nitric rinse container number(s) RMA-TURN-MMTL-RN2-BHN Liquid level marked? ✓
- (5A) Impinger 4 condensate and nitric rinse container number(s) RMA-TURN-MMTL-RN2-Imp4 Liquid level marked? ✓
- (5B) KMnO<sub>4</sub> impingers 5 and 6 and KMnO<sub>4</sub> and water rinse container number(s) RMA-TURN-MMTL-RN2-KMNO4 Liquid level marked? ✓
- (5C) 8NHCl rinse (if required) container number RMA-TURN-MMTL Liquid level marked? ✓
- (7) Blank acetone container number RN2-H2O Liquid level marked? \_\_\_\_\_
- (8) Blank 0.1N nitric container number \_\_\_\_\_ Liquid level marked? \_\_\_\_\_
- (9) Blank nitric/H<sub>2</sub>O<sub>2</sub> container number \_\_\_\_\_ Liquid level marked? \_\_\_\_\_
- (10) Blank KMNO<sub>4</sub> container number \_\_\_\_\_ Liquid level marked? \_\_\_\_\_
- (11) Blank 8N HCl container number \_\_\_\_\_ Liquid level marked? \_\_\_\_\_
- (12) Blank Filter container number \_\_\_\_\_ Liquid level marked? \_\_\_\_\_

Samples stored and locked OK JDO

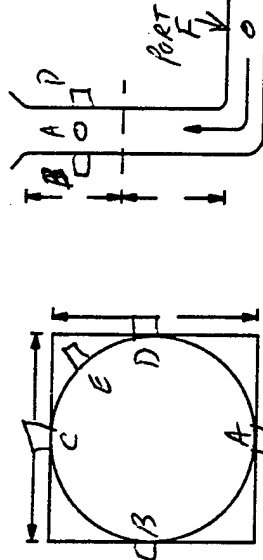
Date of laboratory custody \_\_\_\_\_

Laboratory personnel taking custody \_\_\_\_\_

Remarks: MOOIO blank run setup for RMA JDO recovered along with JDO

NOTE: Container (6) is the silica gel.

## VOST FIELD DATA FORM



PLAN OR ELEVATION

CROSS-SECTION

LEAK CHECKS SET ONE: SET TWO: SET THREE: SET FOUR: SET FIVE: SET SIX:

INITIAL: FINAL: GOOD BAD GOOD BAD GOOD BAD GOOD BAD GOOD BAD GOOD BAD

CLIENT RMA-501  
PLANT Denver Colorado  
LOCATION SPARK GROUND  
OPERATOR JACK MILLS  
RUN NO. 120 DATE 6/1/93  
AMBIENT TEMP. (deg F) 80  
BARO. PRESS. (in Hg) 24.57  
METER BOX NO. 1057-4  
METER BOX ΔH @ N/A  
METER BOX CAL. (Y) 9963  
PROBE LENGTH (ft) 3 FT  
PROBE LINER MATERIAL 2005120475  
PROBE HEATER SETTING > 150 °C  
K FACTOR

TRAVERSE POINT NUMBER	SAMPLING TIME (min)	24-HOUR CLOCK TIME	ROTO-METER SETTING	ORIFICE METER PRESSURE DIFFERENTIAL (delta H) (in. H <sub>2</sub> O)	GAS METER READING (liter)	DRY GAS METER TEMPERATURE INLET (deg C) OUTLET (deg C)	PROBE TEMP. (deg C)	PUMP VACUUM (in. Hg gauge)	FIRST CONDENS. EXIT GAS TEMP. (deg C)	SECOND CONDENS. EXIT GAS TEMP. (deg C)
PORT	0	0738			123.552					
F	5		78	1.5	129.0	N/A	191	7	15	14
	10		80	1.5	134.7		192	11	10	12
	15		80	1.5	140.2		192	12	10	12
	20	0758	77	1.5	145.798		193	12	10	13
				(1.50)	(22.196)					
	0	0810			140.772					
	5		78	1.4	152.2	N/A	182	2.5	13	13
	10		78	1.3	157.7		182	3.5	10	13
	15		78	1.4	163.1		182	3.5	10	13
	20	0830	78	1.5	168.440		208	3.5	11	14
				(1.45)	(21.668)					
	0	0848			169.150					
	5		78	1.5	174.6	N/A	179	5.0	12	12
	10		80	1.5	180.0		176	6.0	11	13
	15		78	1.5	186.2		184	6.0	11	13
	20	0908	78	1.5	191.25		207	6.0	11	13
	TOTAL			AVG. ΔH (1.50)	TOTAL V <sub>m</sub> (21.975)	AVG. T <sub>m</sub> (33.75)	AVG. T <sub>s</sub>	MAX. VAC.	MAX. TEMP.	MAX. TEMP.

COMMENTS: probe was late checked before + after test run



# VOST FIELD DATA FORM

CLIENT RMA-501 OPERATOR Jack Mills SHEET 2 OF 2  
PLANT Denver Colorado RUN NO. Two DATE 6/11/93  
LOCATION Stack Breach #2 K FACTOR \_\_\_\_\_

TRAVERSE POINT NUMBER	SAMPLING TIME (min)	24-HOUR CLOCK TIME	ROTO-METER SETTING	ORIFICE METER PRESSURE DIFFERENTIAL (delta H) (in. H <sub>2</sub> O)	GAS METER READING (liters)	DRY GAS METER TEMPERATURE		PROBE TEMP. (deg C)	PUMP VACUUM (in. Hg gauge)	FIRST CONDENS. EXIT GAS TEMP. (deg C)	SECOND CONDENS. EXIT GAS TEMP. (deg C)
						INLET (deg C)	OUTLET (deg C)				
0	0	0920	80	1.5	192.075	N/A	35	184	6.0	14	14
5	5		78	1.4	197.4		35	192	8.0	9	11
10	10		80	1.5	203.0		35	194	9.0	10	12
15	15		80	1.5	208.6		35	192	9.0	10	12
20	20	0940	80	1.5	214.122		35				
				(1.475)	(22.047)		(35.00)				
0	0	0954			215.120						
5	5		80	1.5	220.6	N/A	35	192	6.5	10	13
10	10		78	1.4	226.1		35	195	9.0	10	10
15	15		75	1.4	231.3		36	196	9.0	10	11
20	20	1014	75	1.4	236.685		36	196	9.0	10	11
				(1.425)	(21.565)		(35.50)				
0	0	1027			237.372	N/A					
5	5		80	1.5	243.9		36	192	3.0	13	13
10	10		80	1.5	248.4		36	194	3.0	10	11
15	15		78	1.4	253.8		36	191	3.0	10	12
20	20	1047	78	1.5	259.318		37	193	3.0	11	12
				(1.475)	(21.946)		(36.85)				
TOTAL				AVG. ΔH	TOTAL V <sub>m</sub>	AVG. T <sub>m</sub>		AVG. T <sub>s</sub>	MAX. VAC.	MAX. TEMP.	MAX. TEMP.

COMMENTS: Note ice both manual and 32°F

## GAS ANALYSIS DATA FORM

Date: 6-11-93

Run No.

Sample Location: Stack

Operator: ARB

Sample Type: Single-point or multi-point; grab or integrated

Analytical Method: ORSAT

Orsat Leak Check: OK

[illegible]

$$\% \text{ N}_2 = 100 - (\% \text{ CO}_2 + \% \text{ O}_2 + \% \text{ CO}) =$$

$$MW_d = 0.440 (\% \text{ CO}_2) + 0.320 (\% \text{ O}_2) + 0.280 (\% \text{ N}_2 + \% \text{ CO}) =$$

<sup>a</sup> Net % O<sub>2</sub> = Reading 2 - Reading 1

### Integrated Bag Limits

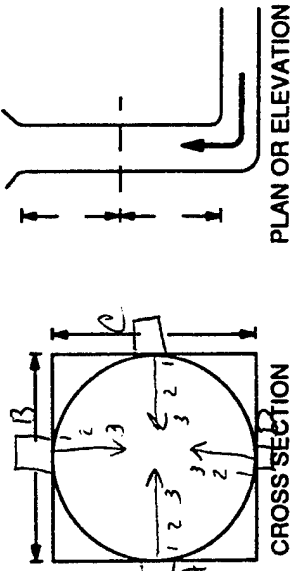
$$\text{CO}_2 > 4\% - 0.3\% \text{ by vol}$$

≤ 4% - 0.2% by vol

$$O_2 \geq 15\% - 0.2\% \text{ by vol}$$

< 15% - 0.3% by vol

CLIENT RMA-SOI  
PLANT SOI  
LOCATION STATIC  
OPERATOR MGH  
RUN NO. 1300 DATE 6/12/83  
AMBIENT TEMP. (deg F) 68°  
BARO. PRESS. (in Hg) 24.62  
METER BOX NO. 101016 #16  
METER BOX#H@ 1942  
METER BOX CAL. (Y) 9923  
PROBE LENGTH (in) 30"  
PROBE LINER MATERIAL 3000  
PROBE HEATER SETTING 25  
K FACTOR 3.12 3.15 3.18 3.21 3.24 330  
10° 65° 70° 75° 80° 90°



## CROSS SECTION

PLAN OR ELEVATION

## LEAK CHECKS

## LEAK CHECKS

## FILTE

FILTER NO. 1399

\_\_\_\_\_

11

TRAVERSE POINT NUMBER	SAMPLING TIME (min)	24-HOUR CLOCK TIME	VELOCITY HEAD (delta P) (in. H <sub>2</sub> O)	ORIFICE METER PRESSURE DIFFERENTIAL (delta H) (in. H <sub>2</sub> O)	GAS METER READING (cubic ft.)	DRY GAS METER TEMPERATURE		SOURCE TEMP. (deg F)	PUMP VACUUM (in. Hg gauge)	IMPINGER EXIT GAS TEMP. (deg F)	FILTER BOX TEMP. (deg F)
						INLET (deg F)	OUTLET (deg F)				
A	0	7:56			758.836						
	1 5		0.42	1.33	762.2	73	71	183	2	61/209	250
	1 10		0.41	1.30	765.6	77	72	183	2	57/198	250
	2 15		0.44	1.55	768.3	79	74	183	2	53/199	250
	2 20		0.41	1.55	773.0	80	75	182	2	52/200	250
	3 25		0.53	1.70	776.8	83	77	182	2	53/202	251
B	3 30	8:26	0.57	1.81	780.894	84	78	183	2	52/201	252
	A F.M.	LC.003 @ 7 1/4									
	3043	LC.008 @ 15 1/4									
	0	8:40			781.139						
	1 5		0.45	1.45	784.6	85	83	183	2	52/221	250
	1 10		0.47	1.49	788.2	85	82	183	2	50/206	249
	2 15		0.59	1.91	792.2	87	83	184	3	50/205	250
	2 20		0.55	1.78	796.1	85	84	183	3	54/209	250
	3 25		0.59	1.97	800.2	90	85	183	3	58/215	250
	3 30	9:10	0.60	1.96	804.236	89	85	183	3	54/211	249
	B.F.M.	LC.005 @ 7 1/4									
TOTAL	0		AVG. $\sqrt{\Delta P}$	AVG. $\Delta H$	TOTAL V <sub>m</sub>	AVG. T <sub>m</sub>		AVG. T <sub>s</sub>	MAX. VAC.	MAX. TEMP.	MIN. MAX.

**COMMENTS:**



**EPA METHOD 0050 HYDROCHLORIC ACID  
SAMPLE RECOVERY AND INTEGRITY DATA FORM**

Plant RMA-JOE Sample Date 6-12-93  
 Sample Location Shed Run Number Three  
 Sample Recovery Person JRV Recovery Date 6-12-93  
 Filter # 1399

**MOISTURE**

Impingers

	<u>0.1N H<sub>2</sub>SO<sub>4</sub></u>	<u>0.1N NaOH</u>	<u>Silica Gel</u>	
Final volume (wt)	<u>2697</u> ml	<u>207</u> ml	Final wt	<u>319</u> g
Initial volume (wt)	<u>250</u> ml	<u>200</u> ml	Initial wt	<u>300</u> g
Net volume (wt)	<u>2447</u> ml	<u>7</u> ml	Net wt	<u>19</u> g
Total moisture	<u>2457 ± 19 = 2473 ±</u>			
Color of silica gel	<u>blue 80%</u>			
Description of impinger water	<u>all clear</u>			

**RECOVERED SAMPLE**

Blank 0.1N H<sub>2</sub>SO<sub>4</sub> container number \_\_\_\_\_ Sealed \_\_\_\_\_  
 Blank 0.1N NaOH container number \_\_\_\_\_ Sealed \_\_\_\_\_  
 Blank distilled water container number \_\_\_\_\_ Sealed \_\_\_\_\_

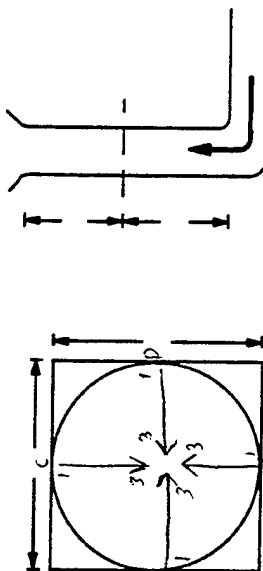
Description of particulate on filter \_\_\_\_\_

Front half acetone RMA-TBURN-M0050-RN3-FHA ✓  
 Filter RMA-TBURN-M0050-RN3-FILT ✓  
 0.1N H<sub>2</sub>SO<sub>4</sub> Impingers container number RMA-TBURN-M0050-RN3-H<sub>2</sub>SO<sub>4</sub> Liquid level marked? ✓  
 0.1N NaOH Impingers container number RMA-TBURN-M0050-RN3-NaOH Liquid level marked? ✓  
 Samples stored and locked On JRV  
 Remarks: TSV = 2900

Date of laboratory custody \_\_\_\_\_  
 Laboratory personnel taking custody \_\_\_\_\_  
 Remarks: \_\_\_\_\_

CLIENT RMH  
 PLANT 507  
 LOCATION Spahn  
 OPERATOR Fritz  
 RUN NO. 15 DATE 6-12-93  
 AMBIENT TEMP. (deg F) 70  
 BARO. PRESS. (in Hg) 24.62  
 METER BOX NO. 15  
 METER BOX ΔH@ 2.010  
 METER BOX CAL. (Y) .9954  
 PROBE LENGTH (in) 30"  
 PROBE LINER MATERIAL BOXO  
 PROBE HEATER SETTING 25  
 K FACTOR 3.00

## EPA METHOD 0010 FIELD DATA FORM



CROSS SECTION PLAN OR ELEVATION

LEAK CHECKS  
 PITOT TUBE: INITIAL Good FINAL Good  
 METHOD THREE: INITIAL Good FINAL Good

TRAVERSE POINT NUMBER	SAMPLING TIME (min)	24-HOUR CLOCK TIME	VELOCITY HEAD (delta P) (in. H <sub>2</sub> O)	ORIFICE METER PRESSURE DIFFERENTIAL (in. H <sub>2</sub> O)	GAS METER READING (cubic ft.)	DRY GAS METER TEMPERATURE INLET (deg F) OUTLET (deg F)	SOURCE TEMP. (deg F)	PUMP VACUUM (in. Hg gauge)	IMPINGER EXIT GAS TEMP. (deg F)	FILTER BOX TEMP. (deg F)	XAD INLET TEMP. (deg F)
0	0756				539.854						
1	15		.35	1.05	542.78	67	183	3.5	258	67	66
1	10		.35	1.05	545.83	68	184	4.0	258	50	64
1	15		.35	1.05	548.87	69	183	4.0	258	51	64
1	10		.33	.99	551.79	70	183	4.0	259	51	62
2	25		.40	1.20	554.94	71	184	5.0	258	51	64
2	30		.40	1.20	558.12	71	183	5.0	258	53	63
2	35		.43	1.29	561.42	72	184	5.5	259	52	65
3	40		.41	1.23	564.71	72	183	5.5	258	51	63
3	45		.49	1.47	568.20	73	183	6.5	258	51	65
3	50		.47	1.41	571.63	74	183	7.0	259	53	67
3	55		.47	1.41	575.04	75	183	7.0	259	51	66
3	60	0856	.49	1.47	578.521	76	184	8.0	258	48	69
					Leak Check .004 @ 11" Hg						
0					578.793						
1	15		.39	1.17	581.95	76	183	7.0	265	66	66
1	10		.40	1.20	585.04	78	183	7.0	258	50	62
1	15		.41	1.23	588.25	79	185	7.0	260	50	65
	TOTAL		AVG. ΔP	AVG. ΔH	TOTAL V <sub>m</sub>	AVG. T <sub>m</sub>	AVG. T <sub>s</sub>	MAX. VAC.	MAX. TEMP.	MIN.	MAX. TEMP.

COMMENTS:



CLIENT KLIA SHEET 23 OF 3  
PLANT 201  
LOCATION 192-04 DATE 6-12-93

EPA METHOD 0010 FIELD DATA FORM  
OPERATOR Frizer  
RUN NO. 300  
K FACTOR 3.00

TRAVERSE POINT NUMBER	SAMPLING TIME (min)	24-HOUR CLOCK TIME	VELOCITY HEAD (delta P) (in. H <sub>2</sub> O)	ORIFICE METER PRESSURE DIFFERENTIAL (in. H <sub>2</sub> O)	GAS METER READING (cubic ft.)	DRY GAS METER TEMPERATURE		SOURCE TEMP. (deg F)	PUMP VACUUM (in. Hg gauge)	IMPINGER EXIT GAS TEMP. (deg F) <small>Imp. Probe Temp</small>	FILTER BOX TEMP. (deg F)	XAD INLET TEMP. (deg F)
						INLET (deg F)	OUTLET (deg F)					
1	20		.41	1.33	591.47	80	77	184	7.5	52	241	66
2	25		.48	1.44	594.88	81	79	183	9.0	53	243	64
2	30		.49	1.47	598.36	81	79	183	9.0	51	243	65
2	35	*1001/1050	.49	1.47	601.85/602.465	82	79	184	9.5	52	245	67
3	40		.51	1.56	605.85	81	80	184	4.0	66	242	63
3	45		.55	1.65	609.60	83	81	183	5.0	49	245	67
3	50		.54	1.62	613.30	84	81	183	5.0	48	244	66
3	55		.57	1.71	617.14	85	82	184	5.5	50	248	66
3	60	1115	.55	1.65	620.917	85	82	184	5.5	53	248	67
					Leak Check	1004 @ 12"Hg						
0		1260			621.237							
1	5		.45	1.35	624.68	84	82	183	5.0	64	237	59
1	10		.48	1.44	628.15	86	83	184	5.0	50	230	63
1	15		.45	1.35	631.65	85	83	184	5.0	49	241	62
1	20		.46	1.38	635.08	86	83	183	5.0	52	242	64
2	25		.53	1.59	638.92	86	84	183	6.0	55	240	66
2	30		.54	1.62	642.50	87	84	183	6.0	55	235	64
2	35		.53	1.59	646.19	86	84	184	6.0	57	235	63
2	40		.51	1.53	649.88	87	84	183	6.5	57	241	65
2	45		.49	1.47	653.60	86	84	184	6.0	58	247	66
3	50		.49	1.47	657.20	87	85	183	6.0	58	250	67
3	55		.59	1.77	660.88	87	85	184	7.5	54	244	66
3	60	1300	.59	1.77	664.814	88	85	183	8.0	53	242	67
0		1315			665.094							
1	5		.42	1.26	668.35	87	85	184	6.0	66	256	66
1	10		.40	1.20	671.66	89	86	183	6.0	51	239	63
1	15		.42	1.26	675.10	88	85	181	6.0	49	234	65
	TOTAL		AVG. $\Delta P$	AVG. $\Delta H$	TOTAL V <sub>m</sub>	AVG. T <sub>m</sub>		AVG. T <sub>s</sub>	MAX. VAC.	MAX. TEMP.	MIN.	MAX. TEMP.

COMMENTS: \*1001 stop test change filter, Leak Check .007 @ 14"Hg Restart Reading 602.098



CLIENT RMA  
PLANT SOI  
LOCATION Grnd

**EPA METHOD 0010 FIELD DATA FORM**

for the SHEET 3 OF 8  
Price DATE 6-12-93  
300 / 3.12

SHEET 3 OF 8  
DATE 6-12-53

[illegible]

**COMMENTS:**

**EPA METHOD 0010  
SAMPLE RECOVERY AND INTEGRITY DATA FORM**

Plant RMA-SQF Sample Date 6-12-93  
 Sample Location Schub Run Number Three  
 Sample Recovery Person JQJ Recovery Date 6-12-93

**MOISTURE**

Impingers Condensor Silica Gel  
 Final volume (wt) 4976 ml 3 ml Final wt 348 g          g  
 Initial volume (wt) 200 ml 0 ml Initial wt 300 g          g  
 Net volume (wt) 4776 ml          ml Net wt 47 g          g  
 Total moisture 4776 + 6 + 48 = 4830  
 Color of silica gel blue 25%  
 Description of impinger water all clear

$XAD F = 354$   
 $XAD T = \frac{348}{6}$

**RECOVERED SAMPLE**

Blank Filter container number          Sealed           
 Blank XAD container number          Sealed           
 Filter/~~XAD~~ container number RMA-TEURN-MOOD-RN3-FILT Sealed ✓  
~~Filter~~/XAD container number RMA-TEURN-MOOD-RN3-XAD Sealed ✓  
 Filter/XAD container number          Sealed           
 Filter/XAD container number          Sealed           
 Description of particulate on filter           
 Condenser water container number          Liquid level marked?           
 Front-half solvent  
   rinse container number RMA-TEURN-MOOD-RN3-FHS Liquid level marked? ✓  
 Impinger contents and back-half  
   water rinse container number RMA-TEURN-MOOD-RN3-COND Liquid level marked? ✓  
 Back-half solvent  
   rinse container number RMA-TEURN-MOOD-RN3-BHS Liquid level marked? ✓  
 Water blank container number          Liquid level marked?           
 Solvent blank container number          Liquid level marked?         

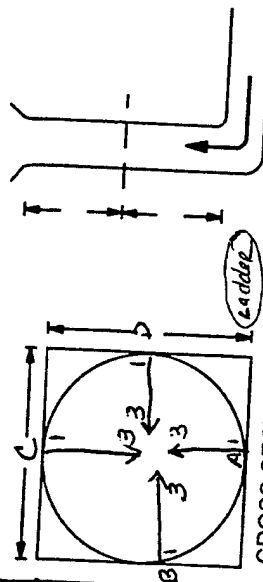
Samples stored and locked on JQJ - maintained cold  
 Remarks:         

Date of laboratory custody           
 Laboratory personnel taking custody           
 Remarks:



CLIENT BMA/SOI  
PLANT SOI  
LOCATION STACK  
OPERATOR DICARLO  
RUN NO. THREE DATE 6-12-93  
AMBIENT TEMP. (deg F) 75°F  
BARO. PRESS. (in Hg) 30.162  
METER BOX NO. 12  
METER BOX ΔH @ 2.012  
METER BOX CAL. (V) 1.010  
PROBE LENGTH (ft) 30"  
PROBE LINER MATERIAL Barosilicate  
PROBE HEATER SETTING 250±25  
K FACTOR 3.01

EPA METHOD 23 FIELD DATA FORM



CROSS SECTION  
PLAN OR ELEVATION  
LEAK CHECKS  
PITOT TUBE: INITIAL GOOD FINAL GOOD  
METHOD THREE: INITIAL GOOD FINAL GOOD

TRAVERSE POINT NUMBER	SAMPLING TIME (min)	24-HOUR CLOCK TIME	VELOCITY HEAD (delta P) (in. H <sub>2</sub> O)	ORIFICE METER PRESSURE DIFFERENTIAL (delta H) (in. H <sub>2</sub> O)	GAS METER READING (cubic ft.)	DRY GAS METER TEMPERATURE INLET (deg F) OUTLET (deg F)	SOURCE TEMP. (deg F)	PUMP VACUUM (in. Hg gauge)	IMPINGER EXIT GAS TEMP. (deg F)	FILTER BOX TEMP. (deg F)	XAD INLET TEMP. (deg F)
0	0	7:56			801.354						
1	5		.44	1.32	804.76	66 66	183	4.0	62 247	251	48
1	10		.45	1.35	808.17	68 67	184	5.0	47 234	250	64
1	15		.43	1.29	811.60	70 67	183	5.0	48 241	250	62
2	20		.43	1.29	814.89	71 68	182	5.0	48 244	251	64
2	25		.52	1.57	818.525	72 69	183	5.5	47 242	255	65
2	30		.52	1.57	822.15	72 69	183	5.5	48 240	250	66
2	35		.54	1.63	825.91	73 70	184	6.0	45 242	249	66
3	40		.54	1.63	829.63	73 70	183	6.0	46 240	250	66
3	45		.60	1.81	833.81	73 71	183	6.5	48 240	252	66
3	50		.58	1.75	837.47	73 71	184	7.0	48 244	253	66
3	55		.56	1.69	841.28	75 73	184	7.0	50 243	253	66
3	60		.58	1.76	845.231	76 73	184	7.5	48 241	252	67
Port 9					LEAK CHECK OK @ 10" Hg @ 0.012						
0	0	9:26			845.501						
1	5		.47	1.43	849.09	76 76	182	7.0	65 250	245	49
1	10		.46	1.39	852.67	76 77	183	7.0	47 245	238	63
1	15		.52	1.58	856.27	79 77	183	8.0	45 237	238	67
			AVG. ΔP	AVG. ΔH	TOTAL V <sub>m</sub>	AVG. T <sub>m</sub>	AVG. T <sub>s</sub>	MAX. VAC.	MAX. TEMP.	MIN.	MAX. TEMP.



CLIENT BMA/SOI  
PLANT SOI  
LOCATION STACIL

EPA METHOD 23 FIELD DATA FORM

OPERATOR

RUN NO.

K FACTOR

DATE

SHEET 2 OF 3

OPERATOR DICARLO

RUN NO. THREE

K FACTOR 3.07

DATE 6-9-93

TRAVERSE POINT NUMBER	SAMPLING TIME (min)	24-HOUR CLOCK TIME	VELOCITY HEAD (in. H <sub>2</sub> O)	ORIFICE METER PRESSURE DIFFERENTIAL (in. H <sub>2</sub> O)	GAS METER READING (cubic ft.)	DRY GAS METER TEMPERATURE		SOURCE TEMP. (deg F)	PUMP VACUUM (in. Hg gauge)	IMPINGER EXIT GAS TEMP. (deg F)	FILTER BOX TEMP. (deg F)	XAD INLET TEMP. (deg F)
						INLET (deg F)	OUTLET (deg F)					
1	20		0.53	1.61	856.27	80	78	184	9.0	47	237	67
2	25		0.50	1.52	863.65	82	79	183	9.5	47	237	67
2	30		0.54	1.66	867.45	82	79	183	11.0	46	237	67
2	35		0.53	1.63	871.95	83	80	184	11.5	48	240	67
2	40		0.54	1.66	876.19	81	81	184	4.5	65	270	67
3	45		0.60	1.94	880.25	83	81	183	6.0	44	230	67
3	50		0.60	1.84	884.23	84	82	184	6.0	45	235	67
3	55		0.62	1.92	888.30	86	83	185	6.5	48	230	65
3	60	11:10	0.62	1.92	892.48	86	84	184	7.0	48	234	67
LEAK CHECK OK, DIL @ 10" Hg												
FILLER DRAINED DURING MORE CHARGING												
PORT P	0	12:00			893.656							
1	5		0.37	1.15	896.89	84	84	185	13.5	65	215	65
1	10		0.38	1.18	900.14	85	84	184	4.0	62	242	66
1	15		0.40	1.24	903.55	87	84	185	4.0	56	240	67
1	20		0.37	1.15	906.84	87	84	184	4.0	55	235	67
2	25		0.45	1.40	910.37	88	85	183	5.0	57	231	67
2	30		0.44	1.38	913.89	88	85	184	5.0	56	235	67
2	35		0.44	1.36	917.38	86	85	185	5.0	56	234	67
2	40		0.43	1.33	920.85	88	86	185	5.0	57	236	67
3	45		0.43	1.33	924.38	88	86	184	5.0	56	230	67
3	50		0.42	1.30	927.8	88	86	184	5.0	55	235	67
3	55		0.49	1.52	931.5	87	85	185	5.0	56	227	65
3	60	13:00	0.52	1.61	935.300	88	86	185	5.0	59	235	66
LC-007074												
PORT D	0											
0	0	13:15			935.544							
1	5		0.32	0.99	938.6	86	86	184	3.0	68	264	67
1	10		0.34	1.05	941.8	89	87	184	4.0	8	271	63
1	15		0.32	0.99	944.9	89	87	183	4.0	56	254	67
TOTAL			AVG. ΔP	AVG. ΔH	TOTAL V <sub>m</sub>	AVG. T <sub>m</sub>	AVG. T <sub>s</sub>	MAX. TEMP.	MAX. VAC.	MAX. TEMP.	MIN.	MAX. TEMP.

COMMENTS: Change out filter @ 10:01 @ 81.695 @ 35 mm Hg Start at 10:50

## EPA METHOD 23 FIELD DATA FORM

CLIENT RMA/SOI  
PLANT SOI  
LOCATION STACK

OPERATOR \_\_\_\_\_  
RUN NO. \_\_\_\_\_  
K FACTOR \_\_\_\_\_

DICARLO  
SHE

DATE 6- -9-

RUN NO.  
 K FACTOR

[illegible]

COMMER



EPA METHOD 23 (PCDD/PCDF)  
SAMPLE RECOVERY AND INTEGRITY DATA FORM

Plant RMA-SRI Sample Date 6-12-93  
Sample Location Stack Run Number Three  
Sample Recovery Person JDD Recovery Date 6-12-93

MOISTURE

Impingers

Final volume (wt) 5088 ml \_\_\_\_\_ ml Final wt 353 g \_\_\_\_\_ g  
Initial volume (wt) 200 ml 0 ml Initial wt 300 g \_\_\_\_\_ g  
Net volume (wt) 4888 ml \_\_\_\_\_ ml Net wt 53 g \_\_\_\_\_ g  
Total moisture 4888 + 11 + 53 = 4952  
Color of silica gel blue 20%  
Description of impinger water all clear

Silica Gel

RECOVERED SAMPLE

Blank Filter container number \_\_\_\_\_ Sealed \_\_\_\_\_  
Filter container number RMA-TBURN-M23-RN3-FILT Sealed ☒  
Blank XAD container number \_\_\_\_\_ Sealed \_\_\_\_\_  
XAD container number RMA-TBURN-M23-RN3-XAD Sealed ☒  
Description of particulate on filter \_\_\_\_\_  
Front-half acetone rinse container number RMA-TBURN-M23-RN3-FHS Liq. lev. marked? ☒  
Front-half methylene chloride rinse container number " Liq. lev. marked? \_\_\_\_\_  
Back-half water container number RMA-TBURN-M23-RN3-COLD Liq. lev. marked? ☒  
Back-half methylene chloride solution rinse RMA-TBURN-M23-RN3-BHS Liq. lev. marked? ☒  
Toluene QA / QC rinse RMA-TBURN-RN3-TOL Liq. lev. marked? ☒  
Blank distilled water container number \_\_\_\_\_ Liq. lev. marked? \_\_\_\_\_  
Blank acetone container number \_\_\_\_\_ Liq. lev. marked? \_\_\_\_\_  
Blank methylene chloride container number \_\_\_\_\_ Liq. lev. marked? \_\_\_\_\_  
Samples stored and locked 500 - on maintenance cold  
Remarks: \_\_\_\_\_

Date of laboratory custody \_\_\_\_\_  
Laboratory personnel taking custody \_\_\_\_\_

Remarks: Notes Blank fresh setup and recovered along with source sample for test run 3

TRAVERSE POINT NUMBER	SAMPLING TIME (min)	24-HOUR CLOCK TIME	VELOCITY HEAD (delta P) (in. H <sub>2</sub> O)	ORIFICE METER PRESSURE DIFFERENTIAL (delta H) (in. H <sub>2</sub> O)	GAS METER READING (cubic ft.)	DRY GAS METER TEMPERATURE		SOURCE TEMP. (deg F)	PUMP VACUUM (in. Hg gauge)	IMPINGER EXIT GAS TEMP. (deg F)	KOH RECIR. RATE. (ml/min)
						INLET (deg F)	OUTLET (deg F)				
D	0	1137			847.000						
	5		1.24	1.68	849.5	85	85	182	2.5	67	50
	10		1.24	1.68	852.6	87	86	182	3.0	66	
	15		1.22	1.63	854.6	87	85	183	3.0	64	
	20		1.43	1.23	857.5	86	84	182	6.0	62	
	25		1.40	1.14	860.7	87	85	182	6.0	60	
3	30	1207	1.42	1.20	864.024	88	85	182	6.0	62	
C	0			LC good		9" Hg					
	5		0.51	1.45	867.6	87	85	181	5.0	65	50
	10	12:16	0.54	1.54	871.2	90	86	182	7.0	61	
	15		0.49	1.39	874.6	89	86	182	7.0	59	
	20		0.49	1.39	878.1	88	88	182	7.5	60	
	25		0.44	1.25	881.5	89	86	183	7.0	65	
3	30	1246	0.36	1.02	884.584	89	86	182	6.0	67	
				LC good		9" Hg					
	TOTAL		AVG. $\sqrt{\Delta P}$	AVG. $\Delta H$	TOTAL V <sub>m</sub>	AVG. T <sub>m</sub>		AVG. T <sub>s</sub>	MAX. VAC.	MAX. TEMP.	

COMMENTS:

**COMMENTS:**



CLIENT RMA OPERATOR KK/WP SHEET 2 OF 2  
PLANT SOI RUN NO. 1406 DATE 6/2/93  
LOCATION STACK K FACTOR

### Cr +6 FIELD DATA FORM

TRAVERSE POINT NUMBER	SAMPLING TIME (min)	24-HOUR CLOCK TIME	VELOCITY HEAD (delta P) (in. H <sub>2</sub> O)	ORIFICE METER PRESSURE DIFFERENTIAL (delta H) (in. H <sub>2</sub> O)	GAS METER READING (cubic ft.)	DRY GAS METER TEMPERATURE		SOURCE TEMP. (deg F)	PUMP VACUUM (in. Hg gauge)	IMPINGER EXIT GAS TEMP. (deg F)	KOH RECIR. RATE (ml/min)
						INLET (deg F)	OUTLET (deg F)				
A	0	13:28	.56	1.60	884.879	88	87	181	6.0	68	50
	5		.56	1.65	888.5	91	88	182	7.0	59	
	10		.51	1.45	892.2	91	88	183	8.0	61	
	15		.53	1.51	895.7	91	88	183	8.0	62	
	20		.39	1.11	902.7	90	88	182	7.0	68	
	25		.41	1.68	906.422	91	88	182	9.0	68	
B	0	14:09	.65	1.85	906.615	91	89	182	8.0	67	50
	5		.61	1.75	911.8	94	90	182	10.0	62	
	10		.56	1.60	915.7	91	88	181	10.0	64	
	15		.49	1.40	919.5	94	90	183	9.5	65	
	20		.49	1.40	923.0	96	91	183	9.0	66	
	25		.45	1.30	926.6	94	90	181	8.5	67	
TOTAL			AVG. $\sqrt{\Delta P}$	AVG. $\Delta H$	TOTAL V <sub>m</sub>	AVG. T <sub>g</sub>		AVG. T <sub>s</sub>	MAX. VAC.	MAX. TEMP.	
120			.67170	1.32917	821.397	88.4		182.7			

COMMENTS: FINAL PK = 9.5

Plant RMA - 5QT Sample Date 6/12/93  
Sample Location STACK Run Number THREE  
Sample Recovery Person K4 Recovery Date 6/12/93

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A diagram of a square with a circle inscribed within it, touching all four sides. Dimension lines are shown: a vertical line on the left side of the square with arrows at both ends, and a horizontal line above the square with arrows at both ends, indicating the side length of the square.

CLIENT RYMA-SQT  
PLANT SQT  
LOCATION SAHUN  
OPERATOR BART-DEN  
RUN NO. Three DATE 6-12-73  
AMBIENT TEMP. (deg F) 78  
BARO. PRESS. (in Hg) 24.62  
METER BOX NO. 9  
METER BOX 4H  
METER BOX CAL. (V) 1.001  
PROBE LENGTH (ft) 20"  
PROBE LINER MATERIAL PO/PO  
PROBE HEATER SETTING LO  
K FACTOR 3.46 3.55  
35 90

CROSS SECTION

PLAN OR ELEVATION

FINAL LEAK RATE

FILTER NO. *N/A*

LEAK CHECKS

PITOT TUBE: INITIAL Good FINAL Good

METHOD THREE: INITIAL NA FINAL NA

SOONER	PUMP	IMPINGER	FILTER

TRAVERSE POINT NUMBER	SAMPLING TIME (min)	24-HOUR CLOCK TIME	VELOCITY HEAD (delta P) (in. H <sub>2</sub> O)	ORIFICE METER PRESSURE DIFFERENTIAL (delta H) (in. H <sub>2</sub> O)	GAS METER READING (cubic ft.)	DRY GAS METER TEMPERATURE		SOURCE TEMP. (deg F)	FORM VACUUM (in. Hg gauge)	EXIT GAS TEMP. (deg F)	BOX TEMP. (deg F)
						INLET (deg F)	OUTLET (deg F)				
B	0	0756	53	1.83	651.565	69	68	184	5	68	240
	5	0	57	1.80	655.4	73	69	185	5	58	240
	10		58	2.06	659.3	79	70	184	5	58	242
	15		55	1.90	663.0	71	79	184	5	59	240
	20		61	2.11	667.5	81	72	184	5	57	245
	25		61	2.11	671.8	80	72	184	5	55	241
	30				676.037						
A	0	0826			LC-00507"14						
	5				676.358						
	10	0840	49	1.70	680.1	75	74	184	5	68	232
	15		45	1.56	683.9	81	75	183	5	58	233
	20		51	1.76	687.8	82	76	184	5	60	238
	25		50	1.73	691.7	83	76	184	5	63	241
	30		56	1.94	695.7	86	78	183	5	66	234
	0910		54	1.87	699.750	86	78	183	5	63	238
					LC-0080746						
TOTAL					TOTAL V <sub>m</sub>	AVG. T <sub>m</sub>		AVG. T <sub>s</sub>	MAX. VAC.	MAX. TEMP.	MIN. MAX.

**COMMENTS**

1-800-4-A-TRIPS



# EPA MULTI-METALS SAMPLE RECOVERY AND INTEGRITY DATA FORM

Plant RMA - JQI Sample Date 6-12-93  
 Sample Location 2nd Run Number Three  
 Sample Recovery Person JPO Recovery Date 6-12-93  
 Filter Number(s) N/A

## MOISTURE

Impingers	HNO <sub>3</sub> /H <sub>2</sub> O <sub>2</sub>	Dry Imp. 3/4	KMNO <sub>4</sub> 246 500	Silica Gel
Final vol (wt)	<u>2285</u> ml	<u>374</u> ml	<u>270</u> ml	Final wt <u>321</u> g
Initial vol (wt)	<u>200</u> ml	<u>0</u> ml	<u>200</u> ml	Initial wt <u>300</u> g
Net volume (wt)	<u>2085</u> ml	<u>374</u> ml	<u>70</u> ml	Net wt <u>21</u> g
Total moisture				<u>2505 + 21 = 2526</u>
				<u>2446</u>
Color of silica gel _____				
Description of particulate <u>light brown</u>				
Description of impinger water (condensate/HNO <sub>3</sub> ) <u>all clear</u>				

## RECOVERED SAMPLE

- Container #
- (1) Filter container number RMA-TDVRN-MMTL-RN3-FILT Sealed ☒
  - (2) Front-half acetone container number(s) RMA-TDVRN-MMTL-RN3-N/A Liquid level marked? ☒
  - (3) Front-half 0.1N nitric container number (s) RMA-TDVRN-MMTL-RN3-FHN Liquid level marked? ☒
  - (4) Back-half condensate impingers (1 through 3) and nitric rinse container number(s) RMA-TDVRN-MMTL-RN3-BHN Liquid level marked? ☒
  - (5A) Impinger 4 condensate and nitric rinse container number(s) RMA-TDVRN-MMTL-RN3-IMP 4 Liquid level marked? ☒
  - (5B) KMnO<sub>4</sub> impingers 5 and 6 and KMnO<sub>4</sub> and water rinse container number(s) RMA-TDVRN-MMTL-RN3-KMNO4 Liquid level marked? ☒
  - (5C) 8NHCl rinse (if required) container number RMA-TDVRN-MMTL- Liquid level marked? ☒
  - (7) Blank acetone container number RN3-ALYH2O Liquid level marked? ☒
  - (8) Blank 0.1N nitric container number \_\_\_\_\_ Liquid level marked? \_\_\_\_\_
  - (9) Blank nitric/H<sub>2</sub>O<sub>2</sub> container number \_\_\_\_\_ Liquid level marked? \_\_\_\_\_
  - (10) Blank KMnO<sub>4</sub> container number \_\_\_\_\_ Liquid level marked? \_\_\_\_\_
  - (11) Blank 8N HCl container number \_\_\_\_\_ Liquid level marked? \_\_\_\_\_
  - (12) Blank Filter container number \_\_\_\_\_ Liquid level marked? \_\_\_\_\_

Samples stored and locked OK JPO

Date of laboratory custody \_\_\_\_\_

Laboratory personnel taking custody \_\_\_\_\_

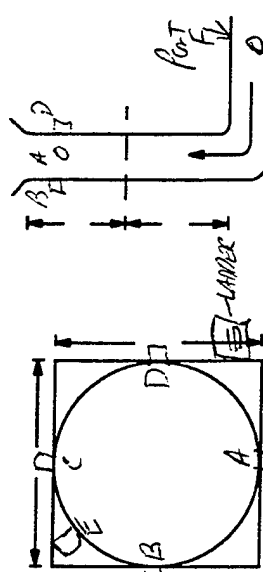
Remarks: \_\_\_\_\_

NOTE: Container (6) is the silica gel.



CLIENT CMA - SGT  
PLANT Denver Colorado  
LOCATION Snake Breeding  
OPERATOR Mike Mills  
RUN NO. 11111 DATE 6/12/93  
AMBIENT TEMP. (deg F) 80  
BARO. PRESS. (in Hg) 24  
METER BOX NO. WIST 4  
METER BOX ΔH @ N/A  
METER BOX CAL. (Y) 1996.3  
PROBE LENGTH (ft) 3 FT  
PROBE LINER MATERIAL Perfluorinated  
PROBE HEATER SETTING > 150 °C  
K FACTOR N/A

VOST FIELD DATA FORM



CROSS SECTION PLAN OR ELEVATION

LEAK CHECKS SET ONE: Good SET TWO: Good SET THREE: Good SET FOUR: Good SET FIVE: Good SET SIX: Good  
INITIAL: Good FINAL: Good

TRAVERSE POINT NUMBER	SAMPLING TIME (min)	24-HOUR CLOCK TIME	ROTO-METER SETTING	ORIFICE METER PRESSURE DIFFERENTIAL (in. H <sub>2</sub> O)	GAS METER READING (liter)	DRY GAS METER TEMPERATURE		PROBE TEMP. (deg C)	PUMP VACUUM (in. Hg gauge)	FIRST CONDENS. EXIT GAS TEMP. (deg C)	SECOND CONDENS. EXIT GAS TEMP. (deg C)
						INLET (deg C)	OUTLET (deg C)				
Port F	0	0830	80	1.5	263.342	N/A	35	182	4.0	14	13
	5		80	1.5	268.9		35	178	5.5	10	13
	10		80	1.5	274.6		36	179	5.5	11	14
	15		80	1.5	280.2		36	181	5.5	11	14
	20	0850	78	1.5	285.680		36				
				1.50	22.338		35.50				
	0	0859			286.385	N/A					
	5		78	1.5	291.8		37	178	7.0	12	14
	10		75	1.4	297.2		37	172	8.5	11	14
	15		75	1.4	303.7		37	175	9.0	11	14
	20	0919	78	1.5	307.975		37	184	9.0	11	12
				1.45	21.590		37.00				
	0	0928			308.682	N/A					
	5		80	1.5	314.3		38	186	5.5	14	12
	10		78	1.5	319.5		38	188	7.0	10	11
	15		55	1.4	324.8		38	192	7.0	11	11
	20	0948	75	1.4	329.995		38	194	7.5	11	11
	TOTAL	0		1.45	21.313		38.00	AVG. T <sub>s</sub>	MAX. VAC.	MAX. TEMP.	MAX. TEMP.

COMMENTS: probe was basic checked before & after first run.



# VOST FIELD DATA FORM

CLIENT RMA-SOI  
PLANT DENVER COLONIES  
LOCATION 5th Breathing

OPERATOR Jack Mills SHEET 2 OF 2  
RUN NO. Three DATE 6/12/83  
K FACTOR N/A

TRAVERSE POINT NUMBER	SAMPLING TIME (min)	24-HOUR CLOCK TIME	ROTO-METER SETTING	ORIFICE METER PRESSURE DIFFERENTIAL (in. H <sub>2</sub> O)	GAS METER READING (liters) <sup>100</sup>	DRY GAS METER TEMPERATURE INLET (deg C) OUTLET (deg C)	PROBE TEMP. (deg C)	PUMP VACUUM (in. Hg gauge)	FIRST CONDENS. EXIT GAS TEMP. (deg C)	SECOND CONDENS. EXIT GAS TEMP. (deg C)
	0	1003			330.872 336.4	N/A	192	3.5	13	11
	5		80	1.5	342.0		193	3.5	10	11
	10		78	1.5	347.3		195	5.5	11	14
	15		78	1.5	352.740		195	6.0	12	13
	20	1023	75	(1.505)	(21.898)					
	0	1034			353.520	N/A				
	5		80	1.5	359.2		189	4.0	13	14
	10		78	1.5	365.0		191	5.5	11	13
	15		75	1.4	369.9		193	5.5	12	13
	20	1054	75	1.4	375.110		193	6.0	12	13
				(1.45)	(21.590)					
	0	1104			375.728	N/A				
	5		80	1.5	381.4		187	4.0	15	15
	10		80	1.5	386.7		193	5.5	14	16
	15		78	1.5	392.0		195	5.5	14	16
	20	1124	80	1.5	397.875		197	6.5	13	16
				(1.50)	(22.097)					
TOTAL θ				AVG. ΔH	TOTAL V <sub>m</sub>	AVG. T <sub>m</sub>	AVG. T <sub>s</sub>	MAX. VAC.	MAX. TEMP.	MAX. TEMP.

COMMENTS: All leak checks were  $\leq 0.2$  gTens/min at a vacuum  $> 10$  in Hg

CLIENT RMA

PLANT Deer Creek

LOCATION ADULT 567

OPERATOR MILLS

RUN NO ADULT 567 DATE 6/9/93

AMBIENT TEMP. (deg F) 75

BARO. PRESS. (in Hg) 24.74

METER BOX NO. 12574

METER BOX CAL. (V) N/A

METER BOX CAL. (V) 99631

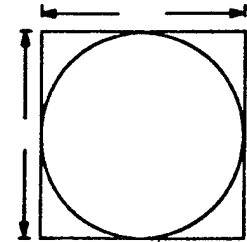
PROBE LENGTH (ft) 2 FT

PROBE LINER MATERIAL TEFLON

PROBE HEATER SETTING

K FACTOR

## VOST FIELD DATA FORM



CROSS SECTION

PLAN OR ELEVATION

TENAX TUBE SAMPLE NUMBERS

SET ONE RMA-T1300-AUG-30-AU1-TP1

SET TWO RMA-T1300-NOV-30-AU1-TP2

SET THREE RMA-T1300-NOV-30-AU1-TP3

SET FOUR RMA-T1300-NOV-30-AU1-TP4

SET FIVE

SET SIX

STACK BLANK

TRAVERSE POINT NUMBER	SAMPLING TIME (min)	24-HOUR CLOCK TIME	ROTO-METER SETTING	ORIFICE METER PRESSURE DIFFERENTIAL (in. H <sub>2</sub> O)	GAS METER READING (liter)	DRY GAS METER TEMPERATURE INLET (deg C) OUTLET (deg C)	PROBE TEMP. (deg C)	PUMP VACUUM (in. Hg gauge)	FIRST CONDENS. EXIT GAS TEMP. (deg C)	SECOND CONDENS. EXIT GAS TEMP. (deg C)
1946	0	1143	78	1.4	892.075	27.1	27.1	<1	11	12
1947	2.5		78	1.4	894.5	27.1	27.1	<1	10	11
1948	5.0		78	1.4	896.9	27.1	27.1	<1	10	11
1949	7.5		78	1.4	899.3	27.1	27.1	<1	10	11
1950	10	1153	68	1.3	901.755	27.1	27.1	<1	10	10
				(1.35)	(9.680)					
					903.510					
1951	0	1204	65	1.3		26	27.1	<1	10	12
1952	2.5									
1953	5.0									
1954	7.5									
1955	10									
1956	0	1212	65	1.3	904.938					
1957	2.5		65	1.3	907.13	26	27.1	<1	12	10
1958	5.0		65	1.3	909.5	26	27.1	<1	11	9
1959	7.5		65	1.3	911.8	26	27.1	<1	11	9
1960	10	1222	65	1.3	914.250	27	27.1	<1	9	9
				(1.35)	(9.312)					
				AVG. ΔH	TOTAL V <sub>m</sub>	AVG. T <sub>m</sub>	AVG. T <sub>g</sub>	MAX. VAC.	MAX. TEMP.	MAX. TEMP.
	TOTAL θ									

COMMENTS:



# VOST FIELD DATA FORM

CLIENT RMA OPERATOR M1/15 SHEET 2 OF 2  
PLANT Denver Colorado RUN NO. ADT 567 DATE 6/9/03  
LOCATION ADT 567 K FACTOR 0.42

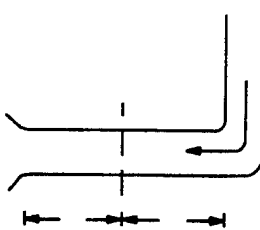
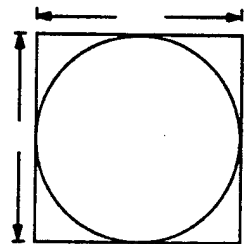
TRAVERSE POINT NUMBER	SAMPLING TIME (min)	24-HOUR CLOCK TIME	ROTO-METER SETTING	ORIFICE METER PRESSURE DIFFERENTIAL (delta H) (in. H <sub>2</sub> O)	GAS METER READING (liters)	DRY GAS METER TEMPERATURE		PROBE TEMP. (deg C)	PUMP VACUUM (in. Hg gauge)	FIRST CONDENS. EXIT GAS TEMP. (deg C)	SECOND CONDENS. EXIT GAS TEMP. (deg C)
						INLET (deg C)	OUTLET (deg C)				
1064	0	1235	65	1.3	915.038	NA	28	7100°C	1.0	12	10
	25		65	1.3	917.16		28	7100°C	1.0	11	10
	50		65	1.3	919.18		28	7100°C	1.0	10	11
	75		65	1.3	922.1		28	7100°C	1.0	10	10
1064	0	1302	65	1.3	924.92	NA	28	7100°C	1.0	10	10
	25		65	1.3	925.352		29	7100°C	2.5	11	10
	50		65	1.3	927.5		29	7100°C	2.5	11	10
	75		65	1.3	929.9		29	7100°C	2.5	9	10
1064	0	1312	65	1.3	932.13		30	7100°C	2.5	11	11
	25		65	1.3	934.582		29.75	7100°C	2.5	11	11
	50		65	1.3	934.582		29.75	7100°C	2.5	11	11
	75		65	1.3	934.582		29.75	7100°C	2.5	11	11
TOTAL				AVG. ΔH	TOTAL V <sub>m</sub>	AVG. T <sub>m</sub>		AVG. T <sub>s</sub>	MAX. VAC.	MAX. TEMP.	MAX. TEMP.

COMMENTS: All leak checks were < 0.02 ft<sup>3</sup>/min at a vacuum > 10 in Hg

## VOST FIELD DATA FORM

CLIENT Denver Colorado  
PLANT Audit 2  
LOCATION Mills  
OPERATOR DATE 6/10/93  
RUN NO. 568  
AMBIENT TEMP. (deg F) 75  
BARO. PRESS. (in Hg) 24.74  
METER BOX NO. 1057  
METER BOX ΔH @ N/A  
METER BOX CAL. (Y) 1000, 996.3 gpm  
PROBE LENGTH (ft) 3 FT  
PROBE LINER MATERIAL Teflon  
PROBE HEATER SETTING \_\_\_\_\_  
K FACTOR \_\_\_\_\_

## CROSS SECTION PLAN OR ELEVATION



LEAK CHECKS SET ONE: Good SET TWO: Good SET THREE: Good SET FOUR: Good SET FIVE: Good SET SIX: Good  
INITIAL: Good FINAL: Good

## TENAX TUBE SAMPLE NUMBERS

SET ONE EMA-TBux-M330-AV2-TP1 (13533)  
SET TWO EMA-TBux-M330-AV2-TP2 (13536)  
SET THREE EMA-TBux-M330-AV2-TP3 (13537)  
SET FOUR EMA-TBux-M330-AV2-TP4 (13538)  
SET FIVE \_\_\_\_\_  
SET SIX \_\_\_\_\_  
STACK BLANK \_\_\_\_\_

TRAVERSE POINT NUMBER	SAMPLING TIME (min)	24-HOUR CLOCK TIME	ROTO-METER SETTING	ORIFICE METER PRESSURE DIFFERENTIAL (delta H) (in. H <sub>2</sub> O)	GAS METER READING (liter)	DRY GAS METER TEMPERATURE INLET (deg C) OUTLET (deg C)	PROBE TEMP. (deg C)	PUMP VACUUM (in. Hg gauge)	FIRST CONDENS. EXIT GAS TEMP. (deg C)	SECOND CONDENS. EXIT GAS TEMP. (deg C)
0	0	1332	65	1.3	935.333	NA	> 100°C	2.0	13	11
2.5	2.5		65	1.3	937.6	30	> 100°C	2.0	12	10
5.0	5.0		65	1.3	939.9	31	> 100°C	2.0	13	11
7.5	7.5	1342	65	1.3	942.2	30.25	> 100°C	2.0	12	13
10	10		65	1.3	944.6					
				1.3	947.6					
		1354	65	1.3	945.202	NA	> 100°C	2.0	16	14
2.5	2.5		65	1.3	947.6	31	> 100°C	2.0	15	16
5.0	5.0		65	1.3	950.1	31	> 100°C	2.0	15	16
7.5	7.5	1404	65	1.3	952.4	31	> 100°C	2.0	15	14
10	10		65	1.3	954.772	31	> 100°C	2.0	15	
				1.3	957.3	31.8				
		1446	65	1.3	955.505	NA	> 100°C	2.0	11	9
2.5	2.5		65	1.3	958.0	29	> 100°C	2.0	10	9
5.0	5.0		65	1.3	960.3	29	> 100°C	2.0	9	9
7.5	7.5	1456	65	1.3	962.7	29	> 100°C	2.0	10	8
10	10		65	1.3	964.960	29	> 100°C	2.0	10	8
TOTAL Ø				AVG. Ø 1.3	TOTAL V 9.455	AVG. T 29.9	AVG. T <sub>s</sub>	MAX. VAC. 2.0	MAX. TEMP. 10	MAX. TEMP. 8

COMMENTS:

# VOST FIELD DATA FORM

[illegible]

COMMENTS: All late checks were  $\leq 47.5$  min at a vacuum  $> 10^{-10}$  Torr

# GAS ANALYSIS DATA FORM

Plant: SQI

Sample Location: 5 mile

Date: 6/12/93

Operator: OWELL

Sample Type: SINGLE POINT or MULTIPOINT: GRAB or INTEGRATED

Analytical Method: Orsat

Leak Check: GOOD

Run Number	Sample Location/Train ID	% CO2 Reading 1	%O2		%N2 100 - Reading 2
			Reading 2	Net (1)	
3	Pant - RW3 + MMTL	<del>9.5</del>	<del>13.3</del>	<del>4.8</del>	100 - Orsat DATA
↓	11	<del>9.6</del>	<del>13.5</del>	<del>4.9</del>	UNREPRESENTATIVE Repeat
↓	11	<del>9.6</del>	<del>13.5</del>	<del>4.9</del>	ANALYSIS below
3B	Semi volatile / cr6	10.2	13.6	3.4	
	D/F (M23)	10.2	13.6	3.4	
		10.0	13.6	3.6	
3A	Semi vol / M23	10.2	13.5	3.3	
		10.2	13.6	3.4	
		10.2	13.6	3.4	
	Avg	(10.17)		(3.42)	
3	Pant - RW3 / MMTL	10.2	13.6	3.4	
		10.0	13.6	3.6	
		10.0	13.7	3.7	
	Avg	(10.07)		3.56	
AVERAGES					

$$\%N_2 = 100 - (\%CO_2 + \%O_2 + \%CO)$$

$$MWd = 0.440(\%CO_2) + 0.320(\%O_2) + 0.280(\%N_2 + \%CO)$$

## Integrated Bag Limits

CO2 > 4% - 0.3% by vol

<= 4% - 0.2% by vol

O2 >= 15% - 0.2% by vol

< 15% - 0.3% by vol

(1) Net %O2 = Reading 2 - Reading 1

**PROCEDURAL CHECKLIST  
FOR EPA METHODS 1, 2, 3 AND 4**

**METHOD 1 DETERMINATIONS**

Date 6/10/93 Time 0835 Operator \_\_\_\_\_ Observer PMM

Stack diameter properly determined? Yes  
Distance to nearest upstream disturbance properly determined? Yes  
Number of stack diameters? \_\_\_\_\_  
Distance of nearest downstream disturbance properly determined? Yes  
Number of sampling points properly selected? \_\_\_\_\_  
Points properly marked on pitot tube? Yes - all  
Verification of cyclonic flow acceptable? Yes

**METHOD 2 SAMPLING**

Date 6/10/93 Time 0835 Operator \_\_\_\_\_ Observer PMM

Equipment identity matches pretest calibration list? Yes  
Pitot tube, lines, and manometer assembled correctly? Yes  
Pitot tube and components mounted interference-free manner? Yes  
Differential pressure gauge has correct sensitivity? Yes  
Differential pressure gauge leveled and zeroed? Yes - all  
Pretest leak check? Yes - all Cyclonic flow checked? Yes  
Orientation of pitot tube correct during traverse? Yes - all  
Sampling port adequately sealed around pitot tube? Yes - all  
Process operating at correct conditions? Yes  
Stable reading taken at each traverse point? Yes  
Static pressure measured? Yes Method used? \_\_\_\_\_  
Moisture content determined? Yes Method used? Pretest - Cr<sup>6+</sup> train  
Orsat samples taken? NO If not, explain why: Used data from previous test program to set up isokinetic sample rates  
Post-test leak-check performed? Yes Leak check results: Good  
Data recorded properly? Yes Calculations correct? Yes

(Continued)

**PROCEDURAL CHECKLIST  
FOR EPA METHODS 1, 2, 3 AND 4**

**METHOD 3 SAMPLING**

Date 6/10/83 Time 0845 Operator \_\_\_\_\_ Observer PMM

Method: Single-point grab \_\_\_\_\_ Single-point integrated \_\_\_\_\_  
Multi-point integrated ✓

Is a filter used to remove particulate matter? NO

Sampling train leak checked? Yes - all

Sampling train purged with stack gas prior to collecting the sample? Yes

Sampling port properly sealed? Yes

Sampling rate held constant? Yes

**METHOD 3 ANALYSIS**

Molecular weight determination by Orsat: Yes

Reagents at the proper level? Yes Analyzer level? Yes

Analyzer leak checked? Yes Analyzed within 8 hours? Yes

Sample line purged? Yes Complete absorption of gases? Yes

The analysis repeated until following analysis criteria met? yes

CO<sub>2</sub> - Any three analyses differ by:

a.  $\leq 0.3\%$  when CO<sub>2</sub>  $\geq 4.0\%$  yes

b.  $\leq 0.2\%$  when CO<sub>2</sub>  $\leq 4.0\%$  yes

O<sub>2</sub> - Any three analyses differ by:

a.  $\leq 0.3\%$  when O<sub>2</sub>  $\geq 15.0\%$  yes

b.  $\leq 0.2\%$  when O<sub>2</sub>  $\leq 14.0\%$  yes

All readings averaged and reported to nearest 0.1% yes

**PROCEDURAL CHECKLIST  
FOR EPA METHODS 1, 2, 3 AND 4**

**METHOD 4 SAMPLING**

Date 6/10/93 Time 0845 Operator \_\_\_\_\_ Observer PMM

Method conducted in conjunction with pollutant emission test? As part of MMS, H2S, MS/COS

Impingers properly placed? Yes - each train NMTL and Cr+k

Impinger contents: 1st \_\_\_\_\_ 2nd \_\_\_\_\_ 3rd \_\_\_\_\_  
4th \_\_\_\_\_ 5th \_\_\_\_\_ 6th NA

Modifications? NA

Cooling System: Crushed ice ✓ Other \_\_\_\_\_

Sampling time per point see each train Number of points 12

Probe heater on? Yes-all Temperature ~250 Stable? Yes

Filter heater on? Yes-all Temperature ~250 Stable? Yes

Crushed ice in ice bath around impingers? Yes

Pretest leak check conducted? Yes Leakage rate? see trains

Sampling rate constant? NO Isokinetic sampling? Yes

All data recorded properly? Yes

Post-leak check conducted? Yes Leakage rate? see trains

**Analysis - Impinger Contents:**

Method: Volumetric see trains

Glassware cleaned following protocol for concurrent emission test? Yes

Gravimetric? see trains Trip balance calibrated? \_\_\_\_\_

Measurement of silica gel? Yes Balance? \_\_\_\_\_

Color of silica gel? see trains Condition? \_\_\_\_\_

All analytical data recorded properly? Yes

All readings averaged and reported to nearest 0.1%

yes - will be reported as appropriate

**PROCEDURAL CHECKLIST**  
**FOR SEMI-VOLATILE ORGANIC AND PCDD/PCDF SAMPLING**

Date 6/10/93 Time 1402 Operator S. DiCarlo Observer PMM

**Equipment Setup**

Equipment identify matches pretest calibration list? Yes

Probe Nozzle: Stainless steel \_\_\_\_\_ Other Glass

Button-hook ✓ Size .355

Cleaned according to sampling protocol? Yes

Probe Liner: Borosilicate ✓ quartz \_\_\_\_\_ other \_\_\_\_\_

Probe heating system: wrapped

Cleaned according to sampling protocol? Yes

Checked? Yes Temperature ~225 Stable? Yes

Pitot Tube: Type S ✓ Other \_\_\_\_\_

Properly attached to probe (no interference to nozzle)? Yes

Modifications: No

Pitot tube coefficient .84

Differential Pressure Gauge: Inclined manometers ✓ 0-10"

Magnehelics \_\_\_\_\_ Ranges \_\_\_\_\_

Other \_\_\_\_\_ Ranges \_\_\_\_\_

Cyclone (inlet only): Borosilicate Glass NA Other \_\_\_\_\_

Cleaned according to sampling protocol? NA

Filter Holder: Borosilicate Glass ✓ Other \_\_\_\_\_

Frit material: Teflon ✓ Other \_\_\_\_\_

Gasket Material: Silicone \_\_\_\_\_ Other Uton (teflon coated)

Cleaned according to sampling protocol? Yes

Filter or Thimble Type(s): NA Glass Fiber

Condenser: Glass ✓ Other \_\_\_\_\_

Cleaned according to sampling protocol? Yes

Sorbent Trap: Glass ✓ Other \_\_\_\_\_

Thermocouple attached to trap? Yes

Cleaned according to sampling protocol? Yes

Covered with foil at all times? Yes

Impinger train: Number of impingers \_\_\_\_\_

Cleaned according to sampling protocol? 4 + 1 condensate trap

Contents: 1st 100 mls H<sub>2</sub>O 2nd 100 mls H<sub>2</sub>O 3rd empty

4th S.G. 5th                      6th

**PROCEDURAL CHECKLIST**  
**FOR SEMI-VOLATILE ORGANIC AND PCDD/PCDF SAMPLING (Continued)**

Date 6/10/93 Time 1405 Operator S. DiCarlo Observer PMM

Impinger weights or volumes recorded? Yes  
Cooling system ice bath + recirc. pump  
Recirculation pump for condenser set-up? Yes  
Proper connections? Yes  
Modifications None  
Silica Gel: Type Coarse New?        Used? ✓  
Barometer: Mercury        Aneroid        Other Weather Station  
Gas Density Determination: Temperature sensor ✓ Calibration corrected  
Pressure gauge         
Temperature sensor properly attached to probe? Yes  
Recent Calibrations: Pitot tubes Yes  
Meter box Yes Thermocouples/thermometers Yes  
Filters checked visually for irregularities? Yes  
Filters properly centered? Yes Labeled? Yes  
Proper sampling site properly elected? Yes  
Nozzle size properly selected? Yes  
Proper sampling time selected? Yes  
All openings of sampling train plugged (pre-test and post-test) Yes

**Test Procedures**

Impingers, condenser, and sorbent trap properly assembled? Yes  
Cyclone attached (inlet only)? NA  
Pitot lines checked for leaks and plugging? Yes  
Meter box leveled? Yes Manometers zeroed? Yes  
Delta H from most recent calibration 2.012  
Factor = Nomograph setup correctly? Yes K factor 3.09  
Pretest leak check conducted? Yes Leakage rate? see data sheets  
Care taken to avoid scraping port or stack wall? Yes  
Effective seal around probe when in-stack? Yes  
Probe moved to traverse points at proper time? Yes  
Train leak checked during port changes? Before Yes After Yes  
Nozzle and pitot tubes kept parallel to stack at all times? Yes  
Filter(s) ~~or thimbles~~ changed during run? Yes  
Any particulate lost during filter change? NO

**PROCEDURAL CHECKLIST**  
**FOR SEMI-VOLATILE ORGANIC AND PCDD/PCDF SAMPLING (Continued)**

Date 6/10/93 Time 1410 Operator S. DiCarlo Observer PMM

Sorbent trap inlet temperature maintained  $\leq 68^{\circ}\text{F}$ ? Yes  
Data forms completed and data recorded properly? Yes  
*Calculated K Factor* Nomograph setting changed with significant change in the stack temperature? Yes  
Velocity pressure and orifice pressure recorded accurately? Yes  
Post-test leak check conducted? Yes Leakage rate see data sheets  
at inches of mercury \_\_\_\_\_  
Orsat analysis? ✓ Stack \_\_\_\_\_ Integrated ✓  
Approximate stack temperature 2184 Gas sample volume \_\_\_\_\_  
Percent isokinetic calculated Yes

**Sample Recovery**

Brushes: Nylon bristle \_\_\_\_\_ Other Teflon  
Wash Bottles: Glass \_\_\_\_\_ Teflon® yes Other \_\_\_\_\_  
Cleaned according to sampling protocol? yes  
Storage containers: Borosilicate glass yes Other \_\_\_\_\_  
Cleaned according to sampling protocol? yes  
Cap material Teflon lined Leak free? yes  
Petri dishes: Borosilicate glass sample bottles Other \_\_\_\_\_  
Cleaned according to sampling protocol? \_\_\_\_\_  
Graduated cylinder: Borosilicate glass yes Other \_\_\_\_\_  
Subdivisions of graduated cylinder  $\leq 2$  ml? yes  
Cleaned according to sampling protocol? yes  
Balance type electronic Calibrated? yes weight & volume  
Probe allowed to cool sufficiently? yes  
Probe and sample train openings covered? yes  
Clean-up area(s) used Recovery train  
Silica gel: Color? blue Condition? good  
Filter or Thimble Handling: Tweezers used? yes Surgical Gloves? yes  
Any particulate lost? no  
Foil wrapped? yes  
Probe handling: Methanol/methylene chloride rinses yes DCM/ Acetone  
Brushed? yes Other rinses \_\_\_\_\_  
Particulate recovery: Probe nozzle yes Probe fitting N/A  
Probe liner yes Front half of filter holder yes

**PROCEDURAL CHECKLIST**  
**FOR SEMI-VOLATILE ORGANIC AND PCDD/PCDF SAMPLING (Continued)**

Date 6/10/93 Time 1600 Operator DeKarlo Observer Martin/O'Neill

Condenser and filter back half handling:

Methylene chloride/methanol rinses ~~yes~~ NO Other rinses DCM/Acetone

Sorbent trap handling: Capped? yes Stored in cooler? yes

Foil wrapped? yes

Impinger handling: Weighed? yes Distilled water rinses? yes

Methylene Chloride/Methanol Rinses yes/no Other Rinses DCM/Acetone

Methylene Chloride/Acetone Rinses yes

QA/QC Toluene Rinse Performed (Method 23 Only) ~~not~~ yes

Blanks collected: Reagent(s) yes

XAD yes Methanol \_\_\_\_\_ Methylene Chloride yes

Acetone yes Toluene yes

Recovery efficiency samples collected from this train? TOL QA/QC sample collected

Sample numbers: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Samples labeled and stored properly? yes

Liquid levels marked? yes

NOTE: This TSA can also be applied to EPA Method 23 sampling and recovery.

# PROCEDURAL CHECKLIST FOR PARTICULATE SAMPLING

Date 6/10/93 Time 0930 Operator A. McCollum Observer PMM

## Equipment Setup

Equipment identity matches pretest calibration list? Yes

Probe nozzle: Stainless Steel ✓ Glass ✓

Button-hook ✓ Elbow ✓ Size .363

Cleaned according to sampling protocol? Yes

Probe Liner: Borosilicate ✓ Quartz ✓ Other ✓

Cleaned according to sampling protocol? Yes

Probe heating system: wire

Checked? ✓ Temperature ~235 Stable? Yes

Pitot Tube: Type S ✓ Other ✓

Properly attached to probe (no interference to nozzle)? Yes

Modifications: None

Pitot tube coefficient .84

Differential Pressure Gauge: Inclined manometers ✓

Magnehelics ✓ Ranges 0 - 10"

Filter Holder: Borosilicate Glass ✓ Other ✓

Frit material: Borosilicate Glass ✓ Stainless ✓

Teflon ✓ Other ✓

Gasket Material: Silicone ✓ Other Viton w/ teflon coating

Cleaned according to sampling protocol? Yes

Filter Type(s): Quartz

Impinger train: Number of impingers note: Combined with HCL train - 6

Cleaned according to sampling protocol? Yes

Contents: 1st 50 mls H<sub>2</sub>SO<sub>4</sub> 2nd 100 H<sub>2</sub>SO<sub>4</sub> 3rd 100 H<sub>2</sub>SO<sub>4</sub>

4th 100 mls NaOH 5th 100 mls NaOH 6th S.G.

Impinger Weights recorded? ✓

Silica Gel: Type Coarse New? ✓ Used? ✓

Barometer: Mercury ✓ Aneroid ✓ Other Weather station

Gas Density Determination: Temperature sensor ✓

Pressure gauge ✓

Temperature sensor properly attached to probe? Yes

**PROCEDURAL CHECKLIST  
FOR PARTICULATE SAMPLING**  
(Continued)

Date 6/10/93 Time 0935 Operator A. McElhann Observer PMM

**Test Procedures**

Recent Calibrations: Pitot tubes Yes  
Meter Box Yes Thermocouples/thermometers Yes  
Filters checked visually for irregularities? Yes  
Filters properly centered? Yes Labeled? Yes  
Nozzle size properly selected? Yes  
All openings of sampling train plugged (pre-test and post-test) Yes  
Impingers properly assembled? Yes  
Pitot lines checked for leaks and plugging? Yes  
Meter box leveled? Yes Manometers zeroed? Yes  
Delta H from most recent calibration 1.942  
Nomograph setup correctly? Calculator K factor ~3.25  
Pretest leak check conducted? Yes Leakage rate? see data sheets  
Care taken to avoid scraping port or stack wall? Yes  
Effective seal around probe when in-stack? Yes  
Probe moved to traverse points at proper time? Yes  
Leak check conducted during port change? Before Yes After? Yes  
Nozzle and pitot tubes kept parallel to stack at all times? Yes  
Filter(s) changed during run? NO  
Any particulate lost during filter change? NA  
Data forms completed and data recorded properly? Yes  
~~Nomograph~~ setting changed with significant change in the stack temperature? Yes  
Velocity pressure and orifice pressure recorded accurately? Yes  
Post-test leak check conducted? Yes Leakage rate see data sheets  
at inches of mercury see data sheets  
Orsat analysis? Yes Stack ✓ Integrated ✓  
Approximate stack temperature ~184 Gas sample volume see data sheets  
Percent isokinetic calculated Yes

**PROCEDURAL CHECKLIST  
FOR PARTICULATE SAMPLING**  
(Continued)

Date 6/10/93 Time 1145 Operator Meldner Observer O'Neill/Meete

**Sample Recovery**

Brushes: Nylon bristle yes Other \_\_\_\_\_  
Cleansed according to sampling protocol? yes  
Wash Bottles: Glass yes Polyethylene \_\_\_\_\_ Other \_\_\_\_\_  
Cleansed according to sampling protocol? yes  
Storage containers: Borosilicate glass yes Other \_\_\_\_\_  
Cleansed according to sampling protocol? yes  
Cap material Teflon lined Leak free? \_\_\_\_\_  
Petri dishes: Borosilicate glass \_\_\_\_\_ Other plastic  
Cleansed according to sampling protocol? N/A  
Graduated cylinder: Borosilicate glass yes Other \_\_\_\_\_  
Subdivisions of graduated cylinder  $\leq 2$  ml? yes  
Cleansed according to sampling protocol? yes  
Balance type electronic Calibrated? weight vs. volume  
Probe allowed to cool sufficiently? yes  
Probe and sample train openings covered? yes  
Clean-up area(s) used Recover trailer  
Silica gel: Color? blue Condition? good  
Probe handling: Acetone rinse yes 0.1 N Nitric rinse -  
Particulate recovery: Probe nozzle yes Probe fitting N/A  
Probe liner yes Front half of filter holder yes  
Blanks collected: Reagent(s) 0.1 N H<sub>2</sub>SO<sub>4</sub>  
D. I. Water for H<sub>2</sub>O Acetone ✓ and filter  
Impinger rinses: D. I. Water yes Other rinses \_\_\_\_\_  
Samples labeled and stored properly? yes  
Liquid levels marked? yes  
Filter handling: tweezers used? yes Surgical gloves? yes  
Any particulate lost? NO

# PROCEDURAL CHECKLIST FOR HCI SAMPLING

Date 6/10/93 Time \_\_\_\_\_ Operator A. McCollum Observer PMM

## Equipment Setup

Equipment identify matches pretest calibration list? \_\_\_\_\_

Probe Nozzle: Glass ✓

Button-hook ✓ Size .363

Cleaned according to sampling protocol? \_\_\_\_\_

Probe Liner: Borosilicate ✓ quartz \_\_\_\_\_ other \_\_\_\_\_

Probe heating system: wrapped

Cleaned according to sampling protocol? Yes

Checked? ✓ Temperature ~235 Stable? Yes

Pitot Tube: Type S ✓ Other \_\_\_\_\_

Properly attached to probe (no interference to nozzle)? Yes

Modifications: None

Pitot tube coefficient .84

Differential Pressure Gauge: Inclined manometers ✓ 0-10"

Magnehelics \_\_\_\_\_ Ranges \_\_\_\_\_

Other \_\_\_\_\_ Ranges \_\_\_\_\_

Filter Holder: Borosilicate Glass ✓ Other \_\_\_\_\_

Frit material: Teflon ✓ Other \_\_\_\_\_

Gasket Material: Silicone \_\_\_\_\_ Other Viton (Teflon coated)

Cleaned according to sampling protocol? \_\_\_\_\_

Filter Type(s): Quartz

Impinger train: Number of impingers Combined with particulate train - 6

Cleaned according to sampling protocol? Yes

Contents: 1st 50mls H<sub>2</sub>SO<sub>4</sub> 2nd 100mls H<sub>2</sub>SO<sub>4</sub> 3rd 100mls H<sub>2</sub>SO<sub>4</sub>

4th 100mls NaOH 5th 100mls NaOH 6th S.G.

Impinger Weights recorded? \_\_\_\_\_

Cooling System ice bath

Proper connections? Yes

Modifications None

Silica Gel: Type Coarse New? \_\_\_\_\_ Used? ✓

Barometer: Mercury \_\_\_\_\_ Aneroid \_\_\_\_\_ Other Weather Station

Gas Density Determination: Temperature sensor ✓

Pressure gauge \_\_\_\_\_

Temperature sensor properly attached to probe? Yes

**PROCEDURAL CHECKLIST  
FOR HCI SAMPLING  
(Continued)**

Date 6/10/93 Time 0945 Operator A. McCollum Observer PMM

**Test Procedures**

Recent Calibrations: Pitot tubes Yes  
Meter Box Yes Thermocouples/thermometers Yes  
Filters checked visually for irregularities? Yes  
Filters properly centered? Yes Labeled? Yes  
Sampling site properly elected? Yes  
Nozzle size properly selected? Yes  
Proper sampling time selected? Yes  
All openings of sampling train plugged (pre-test and post-test) Yes  
Impingers properly assembled? Yes  
Pitot lines checked for leaks and plugging? Yes  
Meter box leveled? Yes Manometers zeroed? Yes  
Delta H from most recent calibration 1.942  
Nomograph setup correctly? Yes-Calculator K factor ~3.25  
Pretest leak check conducted? Yes Leakage rate? see data sheets  
Care taken to avoid scraping port or stack wall? Yes  
Effective seal around probe when in-stack? Yes  
Probe moved to traverse points at proper time? Yes  
Nozzle and pitot tubes kept parallel to stack at all times? Yes  
Filter(s) changed during run? NO  
Any particulate lost during filter change? NA  
Data forms completed and data recorded properly? Yes  
~~Nomograph~~ <sup>Calculator</sup> setting changed with significant change in the stack temperature? Yes  
~~K factor~~ Velocity pressure and orifice pressure recorded accurately? Yes  
Post-test leak check conducted? Yes Leakage rate see data sheets  
at inches of mercury \_\_\_\_\_  
Orsat analysis? Yes Stack \_\_\_\_\_ Integrated ✓  
Approximate stack temperature ~189 Gas sample volume see data sheets  
Percent isokinetic calculated Yes

# PROCEDURAL CHECKLIST FOR HCI SAMPLING

(Continued)

Date 6/16/93 Time 1145 Operator McClaffin Observer O'Neill

## Sample Recovery

Brushes: Nylon bristle yes Other \_\_\_\_\_

Wash Bottles: Glass \_\_\_\_\_ Polyethylene \_\_\_\_\_ Other Teflon

Cleaned according to sampling protocol? yes

Storage containers: Borosilicate glass yes Other \_\_\_\_\_

Cleaned according to sampling protocol? yes

Cap material Teflon lined Leak free? \_\_\_\_\_

Petri dishes: Borosilicate glass plastic for particulate Other \_\_\_\_\_

Cleaned according to sampling protocol? N/A

Graduated cylinder: Borosilicate glass yes Other \_\_\_\_\_

Subdivisions of graduated cylinder  $\leq 2$  ml? yes

Cleaned according to sampling protocol? yes

Balance type electronic Calibrated? weight vs. volume

Probe allowed to cool sufficiently? yes

Probe and sample train openings covered? yes

Clean-up area(s) used recovery trailer

Impingers recovered separately? Impinger 1,2,3 combined 4,5 combined

Sample label: 1st See Rec. Sheets 2nd \_\_\_\_\_

3rd \_\_\_\_\_ 4th \_\_\_\_\_

5th ↓ 6th \_\_\_\_\_

Silica gel: Color? blue Condition? good

Filter Handling: Tweezers Used? yes Surgical Gloves? yes

Any particulate lost? yes

Probe handling: Distilled water rinse NO

Acetone rinse yes Other rinses NO

Particulate recovery: Probe nozzle yes Surgical gloves? yes

Probe liner yes Front half of filter holder yes

Blanks collected: Reagent(s) 0.1 N H<sub>2</sub>O<sub>2</sub>

Distilled water yes Acetone yes and filter

Recovery efficiency samples collected from this train? NO

Sample numbers: See Recovery Process

Samples labeled and stored properly? yes

Liquid levels marked? yes

**PROCEDURAL CHECKLIST  
FOR HEXAVALENT CHROMIUM SAMPLING**

Date 6/10/93 Time 1415 Operator K. Hill Observer PMM

Equipment Setup

Equipment identity matches pretest calibration list? Yes

Probe nozzle: Glass ✓ Teflon \_\_\_\_\_  
Button-hook ✓ Elbow \_\_\_\_\_ Size .354  
Cleaned according to sampling protocol? Yes

Probe Liner: Teflon ✓ other \_\_\_\_\_  
Cleaned according to sampling protocol? ✓  
Probe heating system: None  
Checked? NA Temperature NA Stable? NA

Pitot Tube: Type S ✓ Other \_\_\_\_\_  
Properly attached to probe (no interference to nozzle)? Yes  
Modifications: None  
Pitot tube coefficient .84

Differential Pressure Gauge: Inclined manometers ✓ 0-10"  
Magnehelics \_\_\_\_\_ Ranges \_\_\_\_\_

Impinger train: Number of impingers 5  
Cleaned according to sampling protocol? Yes  
Contents: 1st 300 KOH 2nd 150 KOH 3rd 75 KOH  
4th empty 5th empty 6th S.G.  
Impinger Weights recorded? \_\_\_\_\_  
KOH Recirculation System Type peristaltic pump  
Proper connections? Yes  
Modifications None

Silica Gel: Type Coarse New? \_\_\_\_\_ Used? ✓

Barometer: Mercury \_\_\_\_\_ Aneroid \_\_\_\_\_ Other \_\_\_\_\_

Gas Density Determination: Temperature sensor ✓  
Pressure gauge \_\_\_\_\_  
Temperature sensor properly attached to probe? Yes

**PROCEDURAL CHECKLIST  
FOR HEXAVALENT CHROMIUM SAMPLING**

Date 6/10/93 Time \_\_\_\_\_ Operator K. Hill Observer PMM

**Test Procedures**

Recent Calibrations: Pitot tubes Yes  
Meter Box Yes Thermocouples/thermometers Yes  
Nozzle size properly selected? Yes  
All openings of sampling train plugged (pre-test and post-test) Yes  
Impingers properly assembled? Yes  
Pitot lines checked for leaks and plugging? Yes  
Meter box leveled? Yes Manometers zeroed? Yes  
Delta H from most recent calibration 1.942  
*calculated* ~~Nomograph~~ setup correctly? Yes K factor 3.0  
Pretest leak check conducted? Yes Leakage rate? see data sheets  
KOH recirculation pump activated Yes  
Care taken to avoid scraping port or stack wall? Yes  
  
Effective seal around probe when in-stack? Yes  
Probe moved to traverse points at proper time? Yes  
Leak check conducted during port change? Before Yes After? Yes  
Nozzle and pitot tubes kept parallel to stack at all times? Yes  
Data forms completed and data recorded properly? Yes  
~~Nomograph~~ setting changed with significant change in the stack temperature? Yes  
Velocity pressure and orifice pressure recorded accurately? Yes  
Post-test leak check conducted? Yes Leakage rate see data sheets  
at inches of mercury \_\_\_\_\_  
Orsat analysis? ✓ Stack \_\_\_\_\_ Integrated ✓  
Approximate stack temperature ~184 Gas sample volume \_\_\_\_\_  
Percent isokinetic calculated Yes

# PROCEDURAL CHECKLIST FOR SEMI-VOLATILE ORGANIC SAMPLING

Date 6/10/93 Time 1005 Operator W. Fritz Observer PMM

## Equipment Setup

Equipment identify matches pretest calibration list? Yes

Probe Nozzle: Stainless steel \_\_\_\_\_ Other Glass

Button-hook ✓ Size .355

Cleaned according to sampling protocol? Yes

Probe Liner: Borosilicate ✓ quartz \_\_\_\_\_ other \_\_\_\_\_

Probe heating system: wrapped

Cleaned according to sampling protocol? Yes

Checked? ✓ Temperature ~ 245 Stable? Yes

Pitot Tube: Type S ✓ Other \_\_\_\_\_

Properly attached to probe (no interference to nozzle)? Yes

Modifications: None

Pitot tube coefficient .84

Differential Pressure Gauge: Inclined manometers ✓ 0-10"

Magnehelics \_\_\_\_\_ Ranges \_\_\_\_\_

Other \_\_\_\_\_ Ranges \_\_\_\_\_

Filter Holder: Borosilicate Glass ✓ Other \_\_\_\_\_

Frit material: Teflon ✓ Other \_\_\_\_\_

Gasket Material: Silicone \_\_\_\_\_ Other Viton (teflon coated)

Cleaned according to sampling protocol? Yes

Filter Type(s): Glass Fiber

Condenser: Glass ✓ Other \_\_\_\_\_

Cleaned according to sampling protocol? Yes

Sorbent Trap: Glass ✓ Other \_\_\_\_\_

Thermocouple attached to trap? Yes

Cleaned according to sampling protocol? Yes

Covered with foil at all times? Yes

Impinger train: Number of impingers 4 + Condensate Flask

Cleaned according to sampling protocol? Yes

Contents: 1st 100 mls H<sub>2</sub>O 2nd 100 mls H<sub>2</sub>O 3rd empty

4th S.G. 5th — 6th —

**PROCEDURAL CHECKLIST**  
**FOR SEMI-VOLATILE ORGANIC SAMPLING (Continued)**

Date 10/6/10/93 Time 1010 Operator W. Fritz Observer PMM

Impinger weights or volumes recorded? Yes  
Cooling system ice bath + recirc pump  
Recirculation pump for condenser set-up? Yes  
Proper connections? Yes  
Modifications None  
Silica Gel: Type Coarse New? \_\_\_\_\_ Used? ✓  
Barometer: Mercury \_\_\_\_\_ Aneroid \_\_\_\_\_ Other Weather Station  
Gas Density Determination: Temperature sensor ✓  
Pressure gauge \_\_\_\_\_  
Temperature sensor properly attached to probe? Yes  
Recent Calibrations: Pitot tubes Yes  
Meter box Yes Thermocouples/thermometers Yes  
Filters checked visually for irregularities? Yes  
Filters properly centered? Yes Labeled? Yes  
Proper sampling site properly elected? Yes  
Nozzle size properly selected? Yes  
Proper sampling time selected? Yes  
All openings of sampling train plugged (pre-test and post-test) Yes

**Test Procedures**

Impingers, condenser, and sorbent trap properly assembled? Yes  
Pitot lines checked for leaks and plugging? Yes  
Meter box leveled? Yes Manometers zeroed? Yes  
Delta H from most recent calibration 2.01  
Nomograph setup correctly? Yes K factor ~2.90  
Pretest leak check conducted? Yes Leakage rate? see data sheets  
Care taken to avoid scraping port or stack wall? Yes  
Effective seal around probe when in-stack? Yes  
Probe moved to traverse points at proper time? Yes  
Train leak checked during port changes? Before Yes After Yes  
Nozzle and pitot tubes kept parallel to stack at all times? Yes  
Filter(s) changed during run? \_\_\_\_\_  
Any particulate lost during filter change? \_\_\_\_\_

**PROCEDURAL CHECKLIST  
FOR SEMI-VOLATILE ORGANIC SAMPLING (Continued)**

Date 6/10/93 Time 1010 Operator W. Fritz Observer PMM

Sorbent trap inlet temperature maintained  $\leq 68^{\circ}\text{F}$ ? Yes

Data forms completed and data recorded properly? Yes

Nomograph setting changed with significant change in the stack temperature? Yes

Velocity pressure and orifice pressure recorded accurately? Yes

Post-test leak check conducted? Yes Leakage rate see data sheets

at inches of mercury \_\_\_\_\_

Orsat analysis? ✓ Stack \_\_\_\_\_ Integrated ✓

Approximate stack temperature 184 Gas sample volume \_\_\_\_\_

Percent isokinetic calculated Yes

**Sample Recovery**

Brushes: Nylon bristle \_\_\_\_\_ Other Teflon

Wash Bottles: Glass \_\_\_\_\_ Teflon® yes Other \_\_\_\_\_

Cleaned according to sampling protocol? yes

Storage containers: Borosilicate glass yes Other \_\_\_\_\_

Cleaned according to sampling protocol? yes

Cap material Teflon lined Leak free? \_\_\_\_\_

Petri dishes: Borosilicate glass bottles Other \_\_\_\_\_

Cleaned according to sampling protocol? yes

Graduated cylinder: Borosilicate glass yes Other \_\_\_\_\_

Subdivisions of graduated cylinder  $\leq 2$  ml? yes

Cleaned according to sampling protocol? yes

Balance type electronic Calibrated? weight vs. vol

Probe allowed to cool sufficiently? yes

Probe and sample train openings covered? yes

Clean-up area(s) used recovery area

Silica gel: Color? blue Condition? good

Filter Handling: Tweezers used? yes Surgical Gloves? yes

Any particulate lost? NO

Foil wrapped? yes

Probe handling: Methanol/methylene chloride rinses yes

Brushed? yes Other rinses \_\_\_\_\_

Particulate recovery: Probe nozzle yes Probe fitting N/A

Probe liner yes Front half of filter holder yes

**PROCEDURAL CHECKLIST  
FOR SEMI-VOLATILE ORGANIC SAMPLING (Continued)**

Date 6/10/93 Time \_\_\_\_\_ Operator \_\_\_\_\_ Observer \_\_\_\_\_

Condenser and filter back half handling:

Methylene chloride/methanol rinses yes Other rinses yes

Sorbent trap handling: Capped? yes Stored in cooler? yes

Foil wrapped? yes

Impinger handling: Weighed? yes Distilled water rinses? yes

Methylene Chloride/Methanol Rinses yes Other Rinses \_\_\_\_\_

Methylene Chloride/Acetone Rinses NO

Blanks collected: Reagent(s) \_\_\_\_\_

XAD yes Methanol yes Methylene Chloride yes

Acetone NO Toluene NO

Recovery efficiency samples collected from this train? NO

Sample numbers: See Recovery Sheet

Samples labeled and stored properly? yes

Liquid levels marked? yes

NOTE: This TSA can also be applied to EPA Method 23 sampling and recovery.

**PARTICULATE/TRACE METALS SAMPLING**

Date 6/10/93 Time 10:15 Operator R. Barber Observer PMM

**Equipment Setup**

Equipment identity matches pretest calibration list? Yes

Probe nozzle: Stainless Steel \_\_\_\_\_ Glass ✓

Button-hook ✓ Elbow \_\_\_\_\_ Size .375

Cleaned according to sampling protocol? Yes

Probe Liner: Borosilicate ✓ Quartz \_\_\_\_\_ Other \_\_\_\_\_

Cleaned according to sampling protocol? Yes

Probe heating system: wrapped

Checked? Yes Temperature ~ 220 Stable? Yes

Pitot Tube: Type S ✓ Other \_\_\_\_\_

Properly attached to probe (no interference to nozzle)? Yes

Modifications: None

Pitot tube coefficient .84

Differential Pressure Gauge: Inclined manometers ✓

Magnehelics \_\_\_\_\_ Ranges 0-10"

Cylone (inlet only): Borosilicate Glass NA Other \_\_\_\_\_

Cleaned according to sampling protocol? NA

Filter Holder: Borosilicate Glass ✓ Other \_\_\_\_\_

Frit material: Borosilicate Glass \_\_\_\_\_ Stainless \_\_\_\_\_

Teflon ✓ Other \_\_\_\_\_

Gasket Material: Silicone \_\_\_\_\_ Other Viton (teflon coated)

Cleaned according to sampling protocol? Yes

Filter Type(s): Quartz

Impinger train: Number of impingers 7

Cleaned according to sampling protocol? Yes

Contents: 1st 50 ml HNO<sub>3</sub>/H<sub>2</sub>O<sub>2</sub> 2nd 100 ml HNO<sub>3</sub>/H<sub>2</sub>O<sub>2</sub> 3rd 100 ml HNO<sub>3</sub>/H<sub>2</sub>O<sub>2</sub>

4th empty 5th 100 ml KMnO<sub>4</sub> 6th KMnO<sub>4</sub> (100 ml) 7. S.

Impinger Weights recorded? \_\_\_\_\_

Cooling System ice bath

Proper connections? yes

Modifications None

Silica Gel: Type Coarse New? \_\_\_\_\_ Used? ✓

Barometer: Mercury \_\_\_\_\_ Aneroid \_\_\_\_\_ Other Weather Station

Gas Density Determination: Temperature sensor ✓

Pressure gauge \_\_\_\_\_

Temperature sensor properly attached to probe? Yes

~~PARTICULATE~~/TRACE METALS SAMPLING

Date 6/10/83 Time 1017 Operator R. Barber Observer PMM

Test Procedures

Recent Calibrations: Pitot tubes Yes  
Meter Box Yes Thermocouples/thermometers Yes  
Filters checked visually for irregularities? Yes  
Filters properly centered? Yes Labeled? Yes  
Nozzle size properly selected? Yes  
All openings of sampling train plugged (pre-test and post-test) Yes  
Impingers properly assembled? Yes  
Pitot lines checked for leaks and plugging? Yes  
Meter box leveled? Yes Manometers zeroed? Yes  
Delta H from most recent calibration 1.902  
*factor* Nomograph setup correctly? Yes K factor ~ 3.56  
Pretest leak check conducted? Yes Leakage rate? see data sheets  
Care taken to avoid scraping port or stack wall? Yes  
Effective seal around probe when in-stack? Yes  
Probe moved to traverse points at proper time? Yes  
Leak check conducted during port change? Before Yes After? Yes  
Nozzle and pitot tubes kept parallel to stack at all times? Yes  
Filter(s) changed during run? No  
Any particulate lost during filter change? NA  
*calculated factor* Data forms completed and data recorded properly? Yes  
Nomograph setting changed with significant change in the stack temperature? Yes  
Velocity pressure and orifice pressure recorded accurately? Yes  
Post-test leak check conducted? Yes Leakage rate see data sheets  
at inches of mercury \_\_\_\_\_  
Orsat analysis? ✓ Stack \_\_\_\_\_ Integrated ✓  
Approximate stack temperature ~184 Gas sample volume \_\_\_\_\_  
Percent isokinetic calculated Yes

Sample Recovery

Brushes: Nylon bristle \_\_\_\_\_ Other Teflon  
Cleaned according to sampling protocol? Yes  
Wash Bottles: Glass Yes Polyethylene Yes Other Yes  
Cleaned according to sampling protocol? Yes

# PARTICULATE/TRACE METALS SAMPLING

Date \_\_\_\_\_ Time \_\_\_\_\_ Operator \_\_\_\_\_ Observer \_\_\_\_\_

Storage containers: Borosilicate glass yes Other \_\_\_\_\_

Cleaned according to sampling protocol? yes

Cap material Teflon lined Leak free? \_\_\_\_\_

Petri dishes: Borosilicate glass bottles for filter Other \_\_\_\_\_

Cleaned according to sampling protocol? yes

Graduated cylinder: Borosilicate glass yes Other \_\_\_\_\_

Subdivisions of graduated cylinder  $\leq 2$  ml? yes

Cleaned according to sampling protocol? yes

Balance type electronic Calibrated? weight v. volume

Probe allowed to cool sufficiently? yes

Probe and sample train openings covered? yes

Clean-up area(s) used recovery shelter

Silica gel: Color? blue Condition? good

Probe handling: Acetone rinse N/A 0.1 N Nitric rinse yes

Particulate recovery: Probe nozzle yes Probe fitting yes

Probe liner yes Front half of filter holder yes

Blanks collected: Reagent(s) KMnO<sub>4</sub>, HNO<sub>3</sub>/H<sub>2</sub>O<sub>2</sub>, HCl/H<sub>2</sub>O

0.1 N Nitric yes Acetone yes

Impinger rinses: 0.1 N Nitric yes Other rinses KMnO<sub>4</sub> Imp S/b

Recovery efficiency samples collected from this train? NO HCl/H<sub>2</sub>O

Sample numbers: \_\_\_\_\_

Samples labeled and stored properly? yes

Liquid levels marked? yes

Filter handling: tweezers used? yes plastic Surgical gloves? yes

Any particulate lost? no

NOTE: The above TSA would also be applied to the EPA Method 12 test train.



## NOZZLE CALIBRATION DATA FORM

Date 6/9/43

Calibrated by W Fritz

Nozzle Identification Number	Nozzle Diameter, Inches <sup>1</sup>			$\Delta D$ , <sup>2</sup>	$D_{avg}$ , <sup>3</sup>
	$D_1$	$D_2$	$D_3$		
JV Glass 355A	.355	.356	.355	.001	.355
MWTL Glass 375A	.375	.375	.375	.000	.375
P/HLL Glass 363A	.364	.363	.363	.001	.363
D/F Glass 355B	.355	.354	.355	.002	.355
P/HLL Glass 363B	.362	.363	.363	.001	.363
MWTL Glass 375B	.374	.375	.375	.001	.375
SV Glass 355C	.355	.355	.355	.000	.355
D/F Glass 355D	.354	.356	.355	.002	.355
CR+6 355A	.354	.354	.353	.001	.354

Where:

<sup>1</sup>  $D_{1,2,3}$  = Three different nozzle diameters, inches; each diameter must be measured to nearest 0.001 in.

<sup>2</sup>  $\Delta D$  = Maximum difference between any two diameters, inches.  $\Delta D$  must be  $\leq 0.004$  in.

<sup>3</sup>  $D_{avg}$  = Nozzle diameter = average of  $D_1$ ,  $D_2$ , and  $D_3$ .

nozzle.frm

SV = 15  
D/F = 12  
MWTL = 9

PITOT TUBE IDENTIFICATION NUMBER: P- 52

## TYPE S PITOT TUBE INSPECTION DATA FORM

PITOT TUBE ASSEMBLY LEVEL? ☒ (YES) ☐ (NO)

PITOT TUBE OPENINGS DAMAGED? ☐ (YES-EXPLAIN BELOW) ☒ (NO)

$\alpha_1 =$  1  $^{\circ}$  ( $<10^{\circ}$ )       $\alpha_2 =$  1  $^{\circ}$  ( $<10^{\circ}$ )

$\beta_1 =$  2  $^{\circ}$  ( $<5^{\circ}$ )       $\beta_2 =$  1  $^{\circ}$  ( $<5^{\circ}$ )

$\gamma =$  0  $^{\circ}$        $\theta =$  0  $^{\circ}$        $A =$  .90 cm (in.)

$z = A \sin \gamma =$  \_\_\_\_\_ cm (in.);  $<0.32$  cm ( $<1/8$  in.),

$w = A \sin \theta =$  \_\_\_\_\_ cm (in.);  $<0.32$  cm ( $<1/8$  in.),

$P_a =$  .45 cm (in.)       $P_b =$  .45 cm (in.)

$D_t =$  .38 cm (in.)

COMMENTS \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

CALIBRATION REQUIRED? ☐ (YES) ☒ (NO)

INSPECTOR Walter Peters DATE 2/12/93

PITOT TUBE IDENTIFICATION NUMBER: P - 53

## TYPE S PITOT TUBE INSPECTION DATA FORM

PITOT TUBE ASSEMBLY LEVEL? ✓ (YES) \_\_\_\_\_ (NO)

PITOT TUBE OPENINGS DAMAGED? \_\_\_\_\_ (YES-EXPLAIN BELOW) ✓ (NO)

$\alpha_1 =$  0  $^{\circ}$  ( $<10^{\circ}$ )       $\alpha_2 =$  2  $^{\circ}$  ( $<10^{\circ}$ )

$\beta_1 =$  1  $^{\circ}$  ( $<5^{\circ}$ )       $\beta_2 =$  0  $^{\circ}$  ( $<5^{\circ}$ )

$\gamma =$  3  $^{\circ}$        $\theta =$  1  $^{\circ}$        $A =$  .92 cm (in.)

$z = A \sin \gamma =$  .048 cm (in.);  $<0.32$  cm ( $<1/8$  in.),

$w = A \sin \theta =$  .016 cm (in.);  $<0.32$  cm ( $<1/8$  in.),

$P_a =$  .46 cm (in.)       $P_b =$  .46 cm (in.)

$D_t =$  .38 cm (in.)

COMMENTS \_\_\_\_\_

CALIBRATION REQUIRED? \_\_\_\_\_ (YES) ✓ (NO)

INSPECTOR Walter Peters DATE 2/5/93

PITOT TUBE IDENTIFICATION NUMBER: P - 64

## TYPE S PITOT TUBE INSPECTION DATA FORM

PITOT TUBE ASSEMBLY LEVEL? ✓ (YES) \_\_\_\_\_ (NO)

PITOT TUBE OPENINGS DAMAGED? \_\_\_\_\_ (YES-EXPLAIN BELOW) ✓ (NO)

$\alpha_1 =$  1  $^{\circ}$  ( $<10^{\circ}$ )       $\alpha_2 =$  0  $^{\circ}$  ( $<10^{\circ}$ )

$\beta_1 =$  1  $^{\circ}$  ( $<5^{\circ}$ )       $\beta_2 =$  1  $^{\circ}$  ( $<5^{\circ}$ )

$\gamma =$  1  $^{\circ}$        $\theta =$  0  $^{\circ}$        $A =$  .92 cm (in.)

$z = A \sin \gamma =$  .016 cm (in.);  $<0.32$  cm ( $<1/8$  in.),

$w = A \sin \theta =$  0 cm (in.);  $<0.32$  cm ( $<1/8$  in.),

$P_a =$  .46 cm (in.)       $P_b =$  .46 cm (in.)

$D_t =$  .38 cm (in.)

COMMENTS \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

CALIBRATION REQUIRED? \_\_\_\_\_ (YES) ✓ (NO)

INSPECTOR Walter Peters DATE 2/8/93

PITOT TUBE IDENTIFICATION NUMBER: P - 70

## TYPE S PITOT TUBE INSPECTION DATA FORM

PITOT TUBE ASSEMBLY LEVEL? ☒ (YES) ☐ (NO)

PITOT TUBE OPENINGS DAMAGED? ☐ (YES-EXPLAIN BELOW) ☒ (NO)

$\alpha_1 =$  0  $^{\circ}$  ( $<10^{\circ}$ )       $\alpha_2 =$  0  $^{\circ}$  ( $<10^{\circ}$ )

$\beta_1 =$  2  $^{\circ}$  ( $<5^{\circ}$ )       $\beta_2 =$  0  $^{\circ}$  ( $<5^{\circ}$ )

$\gamma =$  1  $^{\circ}$        $\theta =$  0  $^{\circ}$        $A =$  .94 cm (in.)

$z = A \sin \gamma =$  .016 cm (in.);  $<0.32$  cm ( $<1/8$  in.),

$w = A \sin \theta =$  0 cm (in.);  $<0.32$  cm ( $<1/8$  in.),

$P_a =$  .47 cm (in.)       $P_b =$  .47 cm (in.)

$D_t =$  .38 cm (in.)

COMMENTS \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

CALIBRATION REQUIRED? ☐ (YES) ☒ (NO)

INSPECTOR Walter Peters DATE 2/8/93

PITOT TUBE IDENTIFICATION NUMBER: P - 106

## TYPE S PITOT TUBE INSPECTION DATA FORM

PITOT TUBE ASSEMBLY LEVEL? ✓ (YES) \_\_\_\_\_ (NO)

PITOT TUBE OPENINGS DAMAGED? \_\_\_\_\_ (YES-EXPLAIN BELOW) ✓ (NO)

$\alpha_1 =$  5  $^{\circ}$  ( $<10^{\circ}$ )       $\alpha_2 =$  5  $^{\circ}$  ( $<10^{\circ}$ )

$\beta_1 =$  0  $^{\circ}$  ( $<5^{\circ}$ )       $\beta_2 =$  0  $^{\circ}$  ( $<5^{\circ}$ )

$\gamma =$  1  $^{\circ}$        $\theta =$  5  $^{\circ}$        $A =$  .92 cm (in.)

$z = A \sin \gamma =$  .080 cm (in.);  $<0.32$  cm ( $<1/8$  in.),

$w = A \sin \theta =$  .016 cm (in.);  $<0.32$  cm ( $<1/8$  in.),

$P_a =$  .46 cm (in.)       $P_b =$  .46 cm (in.)

$D_t =$  3.8 cm (in.)

COMMENTS \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

CALIBRATION REQUIRED? \_\_\_\_\_ (YES) ✓ (NO)

INSPECTOR Walter Peters DATE 2/8/93



## LONG/PRE DRY GAS METER CALIBRATION DATA FORM

Calibrator PJM Date 3/26/83 Meter Box Number 9 Plant Univ. of Minn. (NATS)  
Barometric pressure,  $P_b =$  29.73 in. Hg Dry Gas Meter Number 6843913 Comments Refer to 55. base on pump + cal.

Setting	Gas volume		Temperatures						
	Wet test meter	Dry gas meter	Wet test meter	Dry gas meter					
( $\Delta H$ ) in. $H_2O$	( $V_1$ ) $ft^3$	( $V_2$ ) $ft^3$	( $t_w$ ) $^{\circ}F$	Inlet (td.) $^{\circ}F$	Outlet (td.) $^{\circ}F$	Avg ( $t_d$ ) $^{\circ}F$	Time ( $\phi$ ), min	$Y_1$	$\Delta H @ 1 \text{ in. } H_2O$
0.5	87	329.367 322.245	69	80.82, 83	79.84, 81	81	17.8	1.003	1.783
1.0	5	335.502 330.593	69	84.86, 87	80.81, 81	83	9.2	1.003	1.860
1.5	10	346.735 346.835	69	88.90, 91	81.82, 83	86	15.5	1.002	1.969
2.0	10	358.035 347.811	69	91.93, 94	83.83, 84	88	13.5	1.004	1.984
3.0	10	369.342 354.685	69.5	85.89, 92	81.82, 83	85.5	10.8	.9970	1.917
							Avg	Y	$\Delta H @ 1.902$

If there is only one thermometer on the dry gas meter, record the temperature under  $t_d$ .

If there is only one thermometer on the dry gas meter, record the temperature under td.

( $\Delta H$ ) in. $\text{H}_2\text{O}$	$\frac{\Delta H}{13.6}$	$Y_1 = \frac{V_w P_b (t_d + 460)}{V_d (P_b + \frac{\Delta H}{13.6}) (t_w + 460)}$	$\Delta H @ i = \frac{0.0317 \Delta H}{P_b (t_d + 460)} \left[ \frac{(t_w + 460) \Theta}{V_w} \right]^2$
0.5	0.0368	(7)(29.73)(81+460) (7.122)(29.73+0.0368)(69+460)	(0.0317)(1.5) (29.73)(81+460) [17.8]
1.0	0.0735	(5)(29.73)(83+460) (5.104)(29.73+0.0735)(69+460)	(0.0317)(1.0) (29.73)(83+460) [9.2]
1.5	0.110	(10)(29.73)(86+460) (10.255)(29.73+0.110)(69+460)	(0.0317)(1.5) (29.73)(86+460) [15.5]
2.0	0.147	(10)(29.73)(88+460) (10.264)(29.73+0.147)(69+460)	(0.0317)(2.0) (29.73)(88+460) [13.5]
3.0	0.221	(10)(29.73)(85.5+460) (10.257)(29.73+0.221)(69.5+460)	(0.0317)(3.0) (29.73)(85.5+460) [10.8]



# STACK TEMPERATURE SENSOR CALIBRATION DATA FORM

DATE 3/26/93  
 AMBIENT TEMPERATURE 70  
 CALIBRATION OK; per

POTENTIOMETER NUMBER H2010 9  
 BAROMETRIC PRESSURE 29.73  
 REFERENCE: THERMOCOUPLE SIMULATOR  
 (ACCURACY  $\pm 1^{\circ}\text{F}$ )

REFERENCE TEMPERATURE		TEMPERATURE READING FROM THERMOCOUPLE CHANNEL INPUT NUMBER					AVERAGE TEMPERATURE READING <sup>⊙</sup>	TEMPERATURE DIFFERENCE <sup>⊙</sup> (%)
$^{\circ}\text{C}$	$^{\circ}\text{F}$	1	2	3	4	5		
0	32	32	32	32	32	32	32	0° - 0%
100	212	212	212	212	212	212	212	0° - 0%
500	932	932	932	932	932	932	932	0° - 0%
1000	1832	1826	1826	1826	1826	1826	1826	6° - 26%

COMMENTS \_\_\_\_\_

<sup>⊙</sup> AVERAGE TEMPERATURE READING = MEAN OF THE TEMPERATURE READINGS FOR THE THERMOCOUPLE CHANNELS

<sup>⊙</sup> THE CHANNEL READINGS MUST AGREE WITHIN  $\pm 5^{\circ}\text{F}$  OR  $3^{\circ}\text{C}$

ACCEPTABLE TEMPERATURE DIFFERENCE  $\leq 1.5 = \left( \frac{(\text{REF TEMP}^{\circ}\text{F} + 460) - (\text{TEST TEMP}^{\circ}\text{F} + 460)}{(\text{REF TEMP}^{\circ}\text{F} + 460)} \right) \times 100$



Calibrator

PAM

## POSTTEST DRY GAS METER CALIBRATION DATA FORM

Date 6/29/93 Meter box number 9 Plant RM A-SQT  
Barometric pressure,  $P_b =$  29.43 in. Hg Dry gas meter number 6843913 Pretest  $Y =$  1.001

Setting	Gas Volume		Temperature				Time (e), min.	Vacuum Setting, in. Hg.	Y <sub>1</sub>	Y <sub>1</sub> = $\frac{V_w P_b (t_d + 460)}{V_d (P_b + \frac{\Delta H}{13.7}) (t_w + 460)}$	
	Orifice Manometer	(ΔH) in. H <sub>2</sub> O	(V <sub>w</sub> ) ft <sup>3</sup>	(V <sub>d</sub> ) ft <sup>3</sup>	Wet test meter	Dry gas meter					
						(t <sub>w</sub> ) °F					Inlet (t <sub>d</sub> ) °F
1.77			10	775.259 766.329	70.5	84.8757	79.8181	83	13.9	13	1.026
1.77			10	785.230 775.259	70.5	84.8586	80.8181	83	14.0	13	1.021
1.77			10	795.241 785.230	70.5	85.8487	81.8181	83.5	13.9	13	1.019
Y = 1.022											

If there is only one thermometer on the dry gas meter, record the temperature under  $t_d$ .

$V_w$  = Gas volume passing through the wet test meter,  $ft^3$ .

$V_d$  = Gas volume passing through the dry gas meter,  $ft^3$ .

$t_w$  = Temperature of the gas in the wet test meter,  $^{\circ}F$ .

$t_{d1}$  = Temperature of the inlet gas of the dry gas meter,  $^{\circ}F$ .

$t_{d0}$  = Temperature of the outlet gas of the dry gas meter,  $^{\circ}F$ .

$t_d$  = Average temperature of the gas in the dry gas meter,  $\frac{t_{d1} + t_{d0}}{2}$ .

$\Delta H$  = Pressure differential across orifice, in.  $H_2O$ .

$Y_1$  = Ratio of accuracy of wet test meter to dry gas meter for each run.

$Y$  = Average ratio of accuracy of wet test meter to dry gas meter for all three runs; tolerance = pretest  $Y \pm 0.05Y$ .

$P_b$  = Barometric pressure, in. Hg.

$\phi$  = Time of calibration run, min.

Long calibration required? Yes ☒ No ☐

$$\Delta H @ t = \frac{0.0317 \Delta H}{P_b (t_d + 460)} \left[ \frac{(t_d + 460) \phi^2}{V_d} \right]$$



# STACK TEMPERATURE SENSOR CALIBRATION DATA FORM

DATE 6/29/93  
 AMBIENT TEMPERATURE 76  
 CALIBRATION OK, PM

POTENTIOMETER NUMBER 2010 # 9  
 BAROMETRIC PRESSURE 29.43  
 REFERENCE: THERMOCOUPLE SIMULATOR  
 (ACCURACY  $\pm 1^{\circ}\text{F}$ )

REFERENCE TEMPERATURE $^{\circ}\text{C}$ $^{\circ}\text{F}$		TEMPERATURE READING FROM THERMOCOUPLE CHANNEL INPUT NUMBER					AVERAGE TEMPERATURE READING $^{\circ}$	TEMPERATURE DIFFERENCE $^{\circ}$ (%)
		1	2	3	4	5		
0	32	33	33	33	33	33	33	1 $^{\circ}$ - .20%
100	212	213	213	213	213	213	213	1 $^{\circ}$ - .14%
500	932	932	932	932	932	932	932	0 $^{\circ}$ - 0%
1000	1832	1827	1827	1827	1827	1827	1827	5 $^{\circ}$ - .21%

COMMENTS

$^{\circ}$  AVERAGE TEMPERATURE READING = MEAN OF THE TEMPERATURE READINGS FOR THE THERMOCOUPLE CHANNELS

$^{\circ}$  THE CHANNEL READINGS MUST AGREE WITHIN  $\pm 5^{\circ}\text{F}$  OR  $3^{\circ}\text{C}$

ACCEPTABLE TEMPERATURE DIFFERENCE  $\leq 1.5 = \left( \frac{(\text{REF TEMP}^{\circ}\text{F} + 460) - (\text{TEST TEMP}^{\circ}\text{F} + 460)}{(\text{REF TEMP}^{\circ}\text{F} + 460)} \right) \times 100$



## LONG/PRE DRY GAS METER CALIBRATION DATA FORM

Calibrator ACM Plant RMA-501  
Date 6/3/88 Meter Box Number 2010 # 12  
Barometric pressure,  $P_b = 29.45$  in. Hg Dry Gas Meter Number 6898070 Comments

Setting	Gas volume		Temperatures			Time (e), min	$Y_1$	$\Delta H @ 1 \text{ in. H}_2\text{O}$
	Wet test meter	Dry gas meter	Wet test meter	Inlet (td), $^{\circ}\text{F}$	Outlet (td), $^{\circ}\text{F}$			
( $\Delta H$ ) in. $\text{H}_2\text{O}$	( $V_1$ ) $\text{ft}^3$	( $V_2$ ) $\text{ft}^3$	( $t_w$ ) $^{\circ}\text{F}$					
0.5	5	407.923 404.900	68	79.79, 78	76.77, 76	14.0	1.012	2.188
1.0	5	415.948 410.925	67	77.77, 78	75.75, 75	9.5	1.010	2.013
1.5	10	427.011 416.950	69.5	80.83, 83	77.77, 78	15.3	1.008	1.964
2.0	10	438.077 428.011	69	80.82, 83	77.77, 77	13.2	1.010	1.946
3.0	10	449.077 439.049	69.5	83.84, 85	78.78, 78	10.8	1.011	1.951
						Avg	Y	$\Delta H @ 2.012$

If there is only one thermometer on the dry gas meter, record the temperature under  $t_d$ .

( $\Delta H$ ) in. $\text{H}_2\text{O}$	$\frac{\Delta H}{13.6}$	$Y_1 = \frac{V_w P_b (t_d + 460)}{V_d (P_b + \frac{\Delta H}{13.6}) (t_w + 460)}$	$\Delta H @ i = \frac{0.0317 \Delta H}{P_b (t_d + 460)} \left[ \frac{(t_w + 460) \Theta}{V_w} \right]^2$
0.5	0.0368	$\frac{5.2945 (77.5 + 460)}{5.023 (29.45 + 0.0368) (68 + 460)}$	$\frac{0.0317 \cdot 0.5}{29.45 (77.5 + 460)} \left[ \frac{(68 + 460) 14.0}{5} \right]^2$
1.0	0.0735	$\frac{5.2945 (76.1 + 460)}{5.023 (29.45 + 0.0735) (67 + 460)}$	$\frac{0.0317 \cdot 1.0}{29.45 (76.1 + 460)} \left[ \frac{(67 + 460) 9.5}{5} \right]^2$
1.5	0.110	$\frac{10.2945 (79.5 + 460)}{10.061 (29.45 + 0.110) (69.5 + 460)}$	$\frac{0.0317 \cdot 1.5}{29.45 (79.5 + 460)} \left[ \frac{(69.5 + 460) 15.3}{10} \right]^2$
2.0	0.147	$\frac{10.2945 (79.3 + 460)}{10.036 (29.45 + 0.147) (69 + 460)}$	$\frac{0.0317 \cdot 2.0}{29.45 (79.3 + 460)} \left[ \frac{(69 + 460) 13.2}{10} \right]^2$
3.0	0.221	$\frac{10.2945 (81 + 460)}{10.015 (29.45 + 0.221) (83 + 460)}$	$\frac{0.0317 \cdot 3.0}{29.45 (81 + 460)} \left[ \frac{(83 + 460) 10.8}{10} \right]^2$



# STACK TEMPERATURE SENSOR CALIBRATION DATA FORM

DATE 6/3/93  
 AMBIENT TEMPERATURE 68  
 CALIBRATION OK

POTENTIOMETER NUMBER 12  
 BAROMETRIC PRESSURE 29.45  
 REFERENCE: THERMOCOUPLE SIMULATOR  
 (ACCURACY  $\pm 1^{\circ}\text{F}$ )

REFERENCE TEMPERATURE		TEMPERATURE READING FROM THERMOCOUPLE CHANNEL INPUT NUMBER					AVERAGE TEMPERATURE READING $^{\circ}$	TEMPERATURE DIFFERENCE $^{\circ}$ (%)
$^{\circ}\text{C}$	$^{\circ}\text{F}$	1	2	3	4	5		
0	32	32	31	32	32	32	31.8	$-2^{\circ} - 0.040\%$
100	212	212	212	212	212	212	212	$0^{\circ} - 0\%$
500	932	930	930	930	930	930	930	$2^{\circ} - 0.143\%$
1000	1832	1827	1825	1825	1825	1827	1825.8	$6.2^{\circ} - 0.270\%$

COMMENTS

$^{\circ}$  AVERAGE TEMPERATURE READING = MEAN OF THE TEMPERATURE READINGS FOR THE THERMOCOUPLE CHANNELS

$^{\circ}$  THE CHANNEL READINGS MUST AGREE WITHIN  $\pm 5^{\circ}\text{F}$  OR  $3^{\circ}\text{C}$

ACCEPTABLE TEMPERATURE DIFFERENCE  $\leq 1.5 = \left( \frac{(\text{REF TEMP}^{\circ}\text{F} + 460) - (\text{TEST TEMP}^{\circ}\text{F} + 460)}{(\text{REF TEMP}^{\circ}\text{F} + 460)} \right) \times 100$

Calibrator Ppm

## POSTTEST DRY GAS METER CALIBRATION DATA FORM

Date 6/30/93 Meter box number 12 Plant RMT-SQTBarometric pressure,  $P_b =$  29.50 in. Hg Dry gas meter number 6898070 Pretest Y 1.010

Setting	Gas Volume		Temperature				Time (e), min.	Vacuum Setting, in. Hg.	Y <sub>i</sub>	Y <sub>i</sub> = $\frac{V_w P_b (t_d + 460)}{V_d \left( P_b + \frac{\Delta H}{13.6} \right) (t_w + 460)}$
	Wet test meter	Dry gas meter	Wet test meter	Dry gas meter						
				(t <sub>w</sub> ) °F	Inlet (t <sub>d</sub> ) °F	Outlet (t <sub>d</sub> ) °F				
(ΔH) in. H <sub>2</sub> O	(V <sub>w</sub> ) ft <sup>3</sup>	(V <sub>d</sub> ) ft <sup>3</sup>	(t <sub>w</sub> ) °F	Inlet (t <sub>d</sub> ) °F	Outlet (t <sub>d</sub> ) °F	Average (t <sub>d</sub> ) °F				
1.44	10	100.1024 989.851 <del>100.024</del>	71.5 <del>70.208</del> <del>70.024</del>	79.79.79	78.77.77	78	15.5	11.5	1.9914	
1.44	10	10.0208 0.024	71	78.77.80	76.76.76	77.5	15.6	11.5	1.9903	
1.44	10	20.415 10.207	71	79.80.80	76.76.76	78	15.6	11.5	1.9890	
									Y = 1.9902	

If there is only one thermometer on the dry gas meter, record the temperature under t<sub>d</sub>.V<sub>w</sub> = Gas volume passing through the wet test meter, ft<sup>3</sup>.V<sub>d</sub> = Gas volume passing through the dry gas meter, ft<sup>3</sup>.t<sub>w</sub> = Temperature of the gas in the wet test meter, °F.t<sub>d</sub> = Temperature of the inlet gas of the dry gas meter, °F.t<sub>d</sub> = Temperature of the outlet gas of the dry gas meter, °F.t<sub>d</sub> = Average temperature of the gas in the dry gas meter,  $\frac{t_{d_i} + t_{d_o}}{2}$ .ΔH = Pressure differential across orifice, in. H<sub>2</sub>O.Y<sub>i</sub> = Ratio of accuracy of wet test meter to dry gas meter for each run.

Y = Average ratio of accuracy of wet test meter to dry gas meter for all three runs; tolerance = pretest Y ± 0.05Y.

P<sub>b</sub> = Barometric pressure, in. Hg.

e = Time of calibration run, min.

Long calibration required? Yes ☒ No ☐

$$\Delta H @_I = \frac{0.0317 \Delta H}{P_b (t_w + 460)} \left[ \frac{(t_d + 460) \theta}{V_d} \right]^2$$



# STACK TEMPERATURE SENSOR CALIBRATION DATA FORM

DATE 6/30/93

AMBIENT TEMPERATURE

CALIBRATION

OK, PM

POTENTIOMETER NUMBER

BAROMETRIC PRESSURE

REFERENCE: THERMOCOUPLE SIMULATOR

(ACCURACY  $\pm 1^{\circ}\text{F}$ )

2010 #12  
29.50

REFERENCE TEMPERATURE  $^{\circ}\text{C}$ $^{\circ}\text{F}$	TEMPERATURE READING FROM THERMOCOUPLE CHANNEL INPUT NUMBER					AVERAGE TEMPERATURE READING $^{\circ}$	TEMPERATURE DIFFERENCE $^{\circ}$  (%)
	1	2	3	4	5		
0              32	32	32	32	32	32	32	0° - 0%
100            212	212	212	212	212	212	212	0° - 0%
500            932	931	931	931	931	931	931	1° - .07%
1000           1832	1827	1827	1827	1827	1827	1827	5° - .21%

COMMENTS

⊙ AVERAGE TEMPERATURE READING = MEAN OF THE TEMPERATURE READINGS FOR THE THERMOCOUPLE CHANNELS

⊙ THE CHANNEL READINGS MUST AGREE WITHIN  $\pm 5^{\circ}\text{F}$  OR  $3^{\circ}\text{C}$

ACCEPTABLE TEMPERATURE DIFFERENCE  $\leq 1.5 =$

$$\left( \frac{(\text{REF TEMP}^{\circ}\text{F} + 460) - (\text{TEST TEMP}^{\circ}\text{F} + 460)}{(\text{REF TEMP}^{\circ}\text{F} + 460)} \right) \times 100$$



# LONG/PRE DRY GAS METER CALIBRATION DATA FORM

Calibrator PJW Date 3/25/93 Meter Box Number 15 Plant Univ. of Minn. (DATA)  
 Barometric pressure,  $P_b = 29.73$  in. Hg Dry Gas Meter Number 1348735 Comments cal.

Setting		Gas volume		Temperatures							
Orifice manometer		Wet test meter	Dry gas meter	Wet test meter	Dry gas meter						
( $\Delta H$ ) in. $H_2O$		( $V_1$ ) $ft^3$	( $V_2$ ) $ft^3$	( $t_w$ ) $^{\circ}F$	Inlet ( $t_d$ ) $^{\circ}F$	Outlet ( $t_d$ ) $^{\circ}F$	Avg ( $t_d$ ) $^{\circ}F$	Time ( $\phi$ ), min	$Y_1$	$\Delta H @, in. H_2O$	
0.5		5	675.127 670.024	68	76.7878	76.7676	76.5	13.0	.9943	1.872	
1.0		5	681.254 676.146	68	79.80180	77.7777	78.5	9.4	.9958	1.951	
1.5		10	682.274 703.814	68.5	82.8485	78.7879	81	15.9	.9953	2.087	
2.0		10	693.546 715.141	68.5	86.8788	79.8080	83.5	13.8	.9966	2.082	
3.0		10	704.869	68.5	88.9091	81.8181	85.5	11.2	.9950	2.054	
Avg										$Y$	$\Delta H @$
If there is only one thermometer on the dry gas meter, record the temperature under $t_d$ .										.9954	2.010

If there is only one thermometer on the dry gas meter, record the temperature under  $t_d$ .

( $\Delta H$ ) in. $\text{H}_2\text{O}$	$\frac{\Delta H}{13.6}$	$Y_1 = \frac{V_w P_b (t_d + 460)}{V_d (P_b + \frac{\Delta H}{13.6}) (t_w + 460)}$	$\Delta H @ i = \frac{0.0317 \Delta H}{P_b (t_d + 460)} \left[ \frac{(t_w + 460) \Theta}{V_w} \right]^2$
0.5	0.0368	$(5) (29.73) (76.5 + 460)$ $(5.103) (29.73 + 0.0368) (68 + 460)$	$(.0317) (.5) [(68 + 460) / (13.6)]^2$ $(29.73) (76.5 + 460) / 5$
1.0	0.0735	$(5) (29.73) (78.5 + 460)$ $(5.108) (29.73 + 0.0735) (68 + 460)$	$(.0317) (1.0) [(68 + 460) / (13.6)]^2$ $(29.73) (78.5 + 460) / 5$
1.5	0.110	$(10) (29.73) (81 + 460)$ $(10.246) (29.73 + 0.110) (68.5 + 460)$	$(.0317) (1.5) [(68.5 + 460) / (13.6)]^2$ $(29.73) (81 + 460) / 10$
2.0	0.147	$(10) (29.73) (83.5 + 460)$ $(10.268) (29.73 + 0.147) (68.5 + 460)$	$(.0317) (2.0) [(68.5 + 460) / (13.6)]^2$ $(29.73) (83.5 + 460) / 10$
3.0	0.221	$(10) (29.73) (85.5 + 460)$ $(10.297) (29.73 + 0.221) (68.5 + 460)$	$(.0317) (3.0) [(68.5 + 460) / (13.6)]^2$ $(29.73) (85.5 + 460) / 10$



# STACK TEMPERATURE SENSOR CALIBRATION DATA FORM

DATE 3/25/93  
 AMBIENT TEMPERATURE 67  
 CALIBRATION ok, pm

POTENTIOMETER NUMBER 2010415  
 BAROMETRIC PRESSURE 29.73  
 REFERENCE: THERMOCOUPLE SIMULATOR  
 (ACCURACY  $\pm 1^{\circ}\text{F}$ )

REFERENCE TEMPERATURE		TEMPERATURE READING FROM THERMOCOUPLE CHANNEL INPUT NUMBER					AVERAGE TEMPERATURE READING <sup>⊙</sup>	TEMPERATURE DIFFERENCE <sup>⊙</sup> (%)
$^{\circ}\text{C}$	$^{\circ}\text{F}$	1	2	3	4	5		
0	32	34	35	35	34	34	34.4	2.4 - .48%
100	212	214	215	215	214	214	214.4	2.4 - .35%
500	932	931	932	932	931	931	931.4	.6 - .04%
1000	1832	1827	1828	1828	1827	1827	1827.4	4.6 - .20%

COMMENTS

<sup>⊙</sup> AVERAGE TEMPERATURE READING = MEAN OF THE TEMPERATURE READINGS FOR THE THERMOCOUPLE CHANNELS

<sup>⊙</sup> THE CHANNEL READINGS MUST AGREE WITHIN  $\pm 5^{\circ}\text{F}$  OR  $3^{\circ}\text{C}$

ACCEPTABLE TEMPERATURE DIFFERENCE  $\leq 1.5 = \left( \frac{(\text{REF TEMP}^{\circ}\text{F} + 460) - (\text{TEST TEMP}^{\circ}\text{F} + 460)}{(\text{REF TEMP}^{\circ}\text{F} + 460)} \right) \times 100$



Calibrator PCH POSTTEST DRY GAS METER CALIBRATION DATA FORM

Date 4/18/93 Meter box number 15 Plant RMA-SQI Pretest Y .9928  
Barometric pressure,  $P_b =$  29.73 in. Hg Dry gas meter number 1348735

Setting	Gas Volume		Temperature				Time (e), min.	Vacuum Setting, in. Hg.	Y <sub>1</sub>	Y <sub>1</sub> = $\frac{V_w P_b (t_d + 460)}{V_d (P_b + \frac{\Delta H}{13.6}) (t_w + 460)}$
	Wet test meter	Dry gas meter	Wet test meter	Dry gas meter		Average (t <sub>a</sub> ) °F				
				Inlet (t <sub>d</sub> ) °F	Outlet (t <sub>d</sub> ) °F					
1.4	10	35.725 34.7381	73	84.8485	79.7980	82	13	1.008		
1.4	10	36.7417 35.7325	73	84.8485	80.8980	82	13	1.004		
1.4	10	37.7551 36.7417	73	86.8687	80.8981	83.5	13	1.002		
Y = 1.004										

If there is only one thermometer on the dry gas meter, record the temperature under  $t_d$ .

$V_w$  = Gas volume passing through the wet test meter, ft<sup>3</sup>.

$V_d$  = Gas volume passing through the dry gas meter, ft<sup>3</sup>.

$t_w$  = Temperature of the gas in the wet test meter, °F.

$t_{d1}$  = Temperature of the inlet gas of the dry gas meter, °F.

$t_{d2}$  = Temperature of the outlet gas of the dry gas meter, °F.

$t_d$  = Average temperature of the gas in the dry gas meter,  $\frac{t_{d1} + t_{d2}}{2}$ .

$\Delta H$  = Pressure differential across orifice, in. H<sub>2</sub>O.

$Y_1$  = Ratio of accuracy of wet test meter to dry gas meter for each run.

$Y$  = Average ratio of accuracy of wet test meter to dry gas meter for all three runs; tolerance = pretest  $Y \pm 0.05Y$ .

$P_b$  = Barometric pressure, in. Hg.

$\theta$  = Time of calibration run, min.

Long calibration required? Yes        No       

$$\Delta H @ t = \frac{0.0317 \Delta H}{P_b (t_d + 460)} \left[ \frac{(t_w + 460) \theta}{V_d} \right]^2$$



# STACK TEMPERATURE SENSOR CALIBRATION DATA FORM

DATE 6/18/93  
 AMBIENT TEMPERATURE 72  
 CALIBRATION ok, per

POTENTIOMETER NUMBER 2010 #15  
 BAROMETRIC PRESSURE 29.73  
 REFERENCE: THERMOCOUPLE SIMULATOR  
 (ACCURACY  $\pm 1^{\circ}\text{F}$ )

REFERENCE TEMPERATURE		TEMPERATURE READING FROM THERMOCOUPLE CHANNEL INPUT NUMBER					AVERAGE TEMPERATURE READING <sup>⊙</sup>	TEMPERATURE DIFFERENCE <sup>⊙</sup> (%)
<sup>∘</sup> C	<sup>∘</sup> F	1	2	3	4	5		
0	32	32	33	33	32	32	32.4	.4 <sup>∘</sup> - .08%
100	212	213	214	214	213	213	213.4	1.4 <sup>∘</sup> - .20%
500	932	930	930	930	930	930	930	2 <sup>∘</sup> - .14%
1000	1832	1824	1825	1825	1824	1824	1824.4	7.6 <sup>∘</sup> - .33%

COMMENTS \_\_\_\_\_

<sup>⊙</sup> AVERAGE TEMPERATURE READING = MEAN OF THE TEMPERATURE READINGS FOR THE THERMOCOUPLE CHANNELS

<sup>⊙</sup> THE CHANNEL READINGS MUST AGREE WITHIN  $\pm 5^{\circ}\text{F}$  OR  $3^{\circ}\text{C}$

ACCEPTABLE TEMPERATURE DIFFERENCE  $\leq 1.5 = \left( \frac{(\text{REF TEMP}^{\circ}\text{F} + 450) - (\text{TEST TEMP}^{\circ}\text{F} + 450)}{(\text{REF TEMP}^{\circ}\text{F} + 450)} \right) \times 100$



# LONG/PRE DRY GAS METER CALIBRATION DATA FORM

Calibrator PMA Date 4/09/93 Meter Box Number 16 Plant Radco/Learthree  
 Barometric pressure,  $P_b =$  29.52 in. Hg Dry Gas Meter Number 1348727 Comments \_\_\_\_\_

Setting	Gas volume		Temperatures				Time (e), min	Y <sub>1</sub>	ΔH @, in. H <sub>2</sub> O
	Wet test meter	Dry gas meter	Wet test meter	Dry gas meter					
(Δ H) in. H <sub>2</sub> O	(V <sub>w</sub> ) ft <sup>3</sup>	(V <sub>d</sub> ) ft <sup>3</sup>	(t <sub>w</sub> ) °F	Inlet (t <sub>d</sub> ) °F	Outlet (t <sub>d</sub> ) °F	Avg (t <sub>d</sub> ) °F			
0.5	5	193.829 137.840	70	78.78, 79	74.75, 76	76.5	99.33	1.813	
1.0	5	143.240 144.140	70	79.81, 81	76.76, 76	78	99.27	1.898	
1.5	10	160.440 150.441	70	82.83, 85	77.78, 79	80.5	99.03	1.959	
2.0	10	171.892 161.851	70	85.82, 87	79.80, 80	82.5	99.49	2.028	
3.0	10	183.034 132.030	70	87.88, 89	79.80, 80	89	99.06	2.012	
Avg							Y	Δ H @	
							99.22	1.942	

If there is only one thermometer on the dry gas meter, record the temperature under t<sub>d</sub>.

If there is only one thermometer on the dry gas meter, record the temperature under  $t_d$ .

$(\Delta H) \text{ in. H}_2\text{O}$	$\frac{\Delta H}{13.6}$	$Y_1 = \frac{V_w P_b (t_d + 460)}{V_d (P_b + \frac{\Delta H}{13.6}) (t_w + 460)}$	$\Delta H @ i = \frac{0.0317 \Delta H}{P_b (t_d + 460)} \left[ \frac{(t_w + 460) \Theta}{V_w} \right]^2$
0.5	0.0368	(5)(29.52)(76.5+460) (5.089)(29.52+103.68)(70+460)	(.0317)(.5) [(70+460)(12.7)] <sup>2</sup> (29.52)(76.5+460) 5
1.0	0.0735	(5)(29.52)(78+460) (5.100)(29.52+107.35)(70+460)	(.0317)(1.0) [(70+460)(9.2)] <sup>2</sup> (29.52)(78+460) 5
1.5	0.110	(10)(29.52+110.5)(82.5+460) (10.259)(29.52+110)(70+460)	(.0317)(1.5) [(70+460)(15.3)] <sup>2</sup> (29.52)(82.5+460) 10
2.0	0.147	(10)(29.52)(82+460) (10.237)(29.52+114.7)(70+460)	(.0317)(2.0) [(70+460)(13.5)] <sup>2</sup> (29.52)(82+460) 10
3.0	0.221	(10)(29.52)(84+460) (10.284)(29.52+122.1)(70+460)	(.0317)(3.0) [(70+460)(11.0)] <sup>2</sup> (29.52)(84+460) 10



# STACK TEMPERATURE SENSOR CALIBRATION DATA FORM

DATE 4/09/93  
AMBIENT TEMPERATURE 65  
CALIBRATION OK. JPM

POTENTIOMETER NUMBER 2010 416  
BAROMETRIC PRESSURE 29.53  
REFERENCE: THERMOCOUPLE SIMULATOR  
(ACCURACY  $\pm 1^{\circ}\text{F}$ )

REFERENCE TEMPERATURE		TEMPERATURE READING FROM THERMOCOUPLE CHANNEL INPUT NUMBER					AVERAGE TEMPERATURE READING <sup>⊙</sup>	TEMPERATURE DIFFERENCE <sup>⊙</sup> (%)
$^{\circ}\text{C}$	$^{\circ}\text{F}$	1	2	3	4	5		
0	32	32	34	32	32	32	32.4	.4 - .08%
100	212	212	214	213	212	212	212.6	.6 - .08%
500	932	931	933	932	932	931	931.8	.2 - .01%
1000	1832	1828	1830	1829	1829	1829	1829	3 - .13%

## COMMENTS

<sup>⊙</sup> AVERAGE TEMPERATURE READING = MEAN OF THE TEMPERATURE READINGS FOR THE THERMOCOUPLE CHANNELS

<sup>⊙</sup> THE CHANNEL READINGS MUST AGREE WITHIN  $\pm 5^{\circ}\text{F}$  OR  $3^{\circ}\text{C}$

ACCEPTABLE TEMPERATURE DIFFERENCE  $\leq 1.5 = \left( \frac{(\text{REF TEMP}^{\circ}\text{F} + 460) - (\text{TEST TEMP}^{\circ}\text{F} + 460)}{(\text{REF TEMP}^{\circ}\text{F} + 460)} \right) \times 100$

Calibrator pm

## POSTTEST DRY GAS METER CALIBRATION DATA FORM

Date 6/16/93 Meter box number 16 Plant RMF-S&E Pretest Y 9935  
Barometric pressure,  $P_b =$  29.65 in. Hg Dry gas meter number 1348727

Setting	Gas Volume		Temperature				Vacuum Setting, in. Hg.	Y <sub>1</sub>	Y <sub>1</sub> = $\frac{V_w P_b (t_d + 460)}{V_d (P_b + \frac{\Delta H}{13.6}) (t_w + 460)}$
	Wet test meter	Dry gas meter	Wet test meter	Dry gas meter					
				(t <sub>w</sub> ) °F	Inlet (t <sub>d</sub> ) °F	Outlet (t <sub>d</sub> ) °F			
1.0	10	956.024 945.981	71.5	81.8487	74.7678	80	9	1.007	
1.0	10	946.045 956.021	71	84.8485	76.7777	80.5	9	1.006	
1.0	10	876.237 966.095	71.5	85.8687	78.7879	82	9	1.001	
Y = 1.004								Y = 1.004	

If there is only one thermometer on the dry gas meter, record the temperature under  $t_d$ . $V_w$  = Gas volume passing through the wet test meter,  $ft^3$ . $V_d$  = Gas volume passing through the dry gas meter,  $ft^3$ . $t_w$  = Temperature of the gas in the wet test meter,  $^{\circ}F$ . $t_d$  = Temperature of the inlet gas of the dry gas meter,  $^{\circ}F$ . $t_d$  = Temperature of the outlet gas of the dry gas meter,  $^{\circ}F$ . $t_d$  = Average temperature of the gas in the dry gas meter,  $\frac{t_{d1} + t_{d2}}{2}$ . $\Delta H$  = Pressure differential across orifice, in.  $H_2O$ . $Y_1$  = Ratio of accuracy of wet test meter to dry gas meter for each run. $Y$  = Average ratio of accuracy of wet test meter to dry gas meter for all three runs; tolerance = pretest  $Y \pm 0.05Y$ . $P_b$  = Barometric pressure, in. Hg. $\theta$  = Time of calibration run, min.Long calibration required? Yes ☐ No ☒

$$\Delta H @ t_f = \frac{0.0317 \Delta H}{P_b (t_w + 460)} \left[ \frac{(t_w + 460) \theta}{V_d} \right]^2$$



# STACK TEMPERATURE SENSOR CALIBRATION DATA FORM

DATE 6/16/93  
AMBIENT TEMPERATURE 72  
CALIBRATION OK - PM

POTENTIOMETER NUMBER 2010 #16  
BAROMETRIC PRESSURE 29.65  
REFERENCE: THERMOCOUPLE SIMULATOR  
(ACCURACY  $\pm 1^{\circ}\text{F}$ )

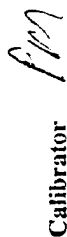
REFERENCE TEMPERATURE		TEMPERATURE READING FROM THERMOCOUPLE CHANNEL INPUT NUMBER					AVERAGE TEMPERATURE READING <sup>⊙</sup>	TEMPERATURE DIFFERENCE <sup>⊙</sup> (%)
<sup>∘</sup> C	<sup>∘</sup> F	1	2	3	4	5		
0	32	32	33	32	32	32	32.2	.2 - .04%
100	212	212	214	213	212	212	212.6	.6 - .08%
500	932	932	933	932	932	932	932.2	.2 - .01%
1000	1832	1830	1830	1830	1830	1830	1830	2 - .08%

COMMENTS

⊙ AVERAGE TEMPERATURE READING = MEAN OF THE TEMPERATURE READINGS FOR THE THERMOCOUPLE CHANNELS

⊙ THE CHANNEL READINGS MUST AGREE WITHIN  $\pm 5^{\circ}\text{F}$  OR  $3^{\circ}\text{C}$

ACCEPTABLE TEMPERATURE DIFFERENCE  $\leq 1.5 = \left( \frac{(\text{REF TEMP}^{\circ}\text{F} + 460) - (\text{TEST TEMP}^{\circ}\text{F} + 460)}{(\text{REF TEMP}^{\circ}\text{F} + 460)} \right) \times 100$



Date 8/13/92 Meter box number 4 Plant Bryghill EPA

Barometric pressure, $P_b =$	in. Hg	Dry gas meter number	Comments
29.67			D506989

Setting			Gas Volume		Temperature				Time (e), min.	Vacuum Setting in. Hg.	Y <sub>i</sub>	Y <sub>i</sub> = $\frac{V_e P_e (V_e + 460)}{V_i \left( P_i + \frac{\Delta H}{T_{18}} \right) (V_e + 460)}$
Liters per minute	Rotometer	Orifice Manometer	Wet test meter	Dry gas meter	Wet test meter	Dry gas meter						
		(Δ H) in. H <sub>2</sub> O	(V <sub>w</sub> ) liters	(V <sub>d</sub> ) liters	(t <sub>w</sub> ) °F	Inlet (t <sub>d</sub> ) °C	Outlet (t <sub>d</sub> ) °C	Average (t <sub>d</sub> ) °C/°F				
.5	37	1.1	5	79.46 74.87	27, 27.27	—	27/80.5	9.7	3	.9921		
.5	37	1.1	96	86.48 80.88	27, 27.28	—	233/81	11.3	3	.9947		
1.0	87	1.45	10	34.17 26.09	26, 26.26	—	26/79	8.5	3	.9987		
1.0	87	1.45	10	51.17 44.11	26, 25.25	—	253/77.5	8.5	3	.9997		
											Y = .9965	

If there is only one thermometer on the dry gas meter, record the temperature under  $t_d$ .

$W =$  Gas volume passing through the wet test meter, liters.

Gas volume passing through the dry gas meter, liters.

Temperature of the gas in the wet test meter, °F.

Temperature of the inlet gas of the dry gas meter, °C.

Temperature of the outlet gas of the dry gas meter, °C.

$$= \frac{\text{Average temperature of the gas in the dry gas meter, } t d_1 + t d_0}{2}.$$
$$\Delta H = \text{Pressure differential across orifice, in. H}_2\text{O.}$$

Ratio of accuracy of wet test meter to dry gas meter for each run.

== Average ratio of accuracy of wet test meter to dry gas meter for all four runs; tolerance = pretest  $\bar{Y} + 0.05\bar{Y}$ .

Barometric pressure, in. Hg.

Time of calibration run, min.

1000



# STACK TEMPERATURE SENSOR CALIBRATION DATA FORM

DATE 8/13/92  
 AMBIENT TEMPERATURE 71  
 CALIBRATION OK JPM

POTENTIOMETER NUMBER 11057 #61  
 BAROMETRIC PRESSURE 29.67  
 REFERENCE: THERMOCOUPLE SIMULATOR  
 (ACCURACY  $\pm 1^{\circ}\text{F}$ )

REFERENCE TEMPERATURE °C °F		TEMPERATURE READING FROM THERMOCOUPLE CHANNEL INPUT NUMBER					AVERAGE TEMPERATURE READING °	TEMPERATURE DIFFERENCE ° (%)
		1	2	3	4	5		
0	32	0	0	0	0		0	0° - 0%
100	212	100	100	100	100		100	0° - 0%
500	932	499	499	499	499		499	1° - .107%
1000	1832	997	997	997	997		997	3° - .23%

## COMMENTS

° AVERAGE TEMPERATURE READING = MEAN OF THE TEMPERATURE READINGS FOR THE THERMOCOUPLE CHANNELS

° THE CHANNEL READINGS MUST AGREE WITHIN  $\pm 5^{\circ}\text{F}$  OR  $3^{\circ}\text{C}$

ACCEPTABLE TEMPERATURE DIFFERENCE  $\leq 1.5 = \left( \frac{(\text{REF TEMP}^{\circ}\text{F} + 460) - (\text{TEST TEMP}^{\circ}\text{F} + 460)}{(\text{REF TEMP}^{\circ}\text{F} + 460)} \right) \times 100$



# SAMPLE CALCULATIONS FOR HYDROGEN CHLORIDE REMOVAL EFFICIENCY

Client: RMA - SQI  
Test Number: Run 1  
Test Location: INCINERATOR STACK

Plant: DENVER, COLORADO  
Test Date: 06-10-93  
Test Period: 0745-1041

## 1. Percent chlorides in POHC's (Carbon Tetrachloride, Chlorobenzene).

where:

141.83 = Total molecular weight of chlorides contained in carbon tetrachloride

153.84 = Molecular weight of carbon tetrachloride

35.45 = Total molecular weight of chlorides contained in chlorobenzene

112.56 = Molecular weight of chlorobenzene

$$R_1 = \frac{141.83}{153.84} = 0.922 \text{ (or 92.2\% Cl)}$$

$$R_2 = \frac{35.45}{112.56} = 0.315 \text{ (or 31.5\% Cl)}$$

## 2. Chloride injection rate, lb/hr.

$$IR_1 = POHC_{IN1} \times R_1$$

$$IR_2 = POHC_{IN2} \times R_2$$

$$IR_1 = 6.90 \times 0.922 = 6.36$$

$$IR_2 = 8.66 \times 0.315 = 2.73$$

where:

$POHC_{IN1}$  = Injection rate of carbon tetrachloride

$POHC_{IN2}$  = Injection rate of chlorobenzene

**3. Total input of chlorides based on POHC injection rates, lb/hr.**

$$T_{Cl} = IR_1 + IR_2$$

$$T_{Cl} = 6.36 + 2.73 = 9.09$$

**4. Total Hydrogen Chloride injection rate, lb/hr.**

$$T_{HCl} = T_{Cl} \times 1.029$$

$$T_{HCl} = 9.09 \times 1.029 = 9.35$$

where:

$$1.029 = \text{Conversion factor representing the ratio of the molecular weights of HCl to Cl.}$$

**5. Hydrogen Chloride removal efficiency, %.**

$$RE = \frac{T_{HCl} - PMR_{HCl}}{T_{HCl}} \times 100$$

$$RE = \frac{9.35 - 0.1273}{9.35} \times 100 = 98.64$$

where:

$$PMR_{HCl} = \text{Hydrogen Chloride mass emission rate, lb/hr.}$$

# SAMPLE CALCULATIONS FOR PARTICULATE ANION TEST (EPA METHOD 5/26A)

Client: RMA - QSI  
Test Number: Run 1  
Test Location: INCINERATOR STACK

Plant: DENVER, COLORADO  
Test Date: 06-10-93  
Test Period: 0745-1041

## 1. Volume of dry gas sampled at standard conditions (68 deg F, 29.92 in. Hg), dscf.

$$Vm(std) = \frac{17.64 \times Y \times Vm \times \left( Pb + \frac{\text{delt H}}{13.6} \right)}{(Tm + 460)}$$

$$Vm(std) = \frac{17.64 \times 0.9923 \times 87.391 \times \left( 24.79 + \frac{1.600}{13.6} \right)}{81.33 + 460} = 70.385$$

Where:

- $Vm(std)$  = Volume of gas sample measured by the dry gas meter, corrected to standard conditions, dscf.
- $Vm$  = Volume of gas sample measured by the dry gas meter at meter conditions, dcf.
- $Pb$  = Barometric Pressure, in Hg.
- $\text{delt H}$  = Average pressure drop across the orifice meter, in  $H_2O$ .
- $Tm$  = Average dry gas meter temperature, deg F.
- $Y$  = Dry gas meter calibration factor.
- 17.64 = Factor that includes ratio of standard temperature (528 deg R) to standard pressure (29.92 in. Hg), deg R/in. Hg.
- 13.6 = Specific gravity of mercury.

## 2. Volume of water vapor in the gas sample corrected to standard conditions, scf.

$$V_w(\text{std}) = (0.04707 \times V_{wc}) + (0.04715 \times W_{wsg})$$

$$V_w(\text{std}) = (0.04707 \times 2545.0) + (0.04715 \times 21.0) = 120.783$$

Where:

$V_w(\text{std})$  = Volume of water vapor in the gas sample corrected to standard conditions, scf.

$V_{wc}$  = Volume of liquid condensed in impingers, ml.

$W_{wsg}$  = Weight of water vapor collected in silica gel, g.

0.04707 = Factor which includes the density of water (0.002201 lb/ml), the molecular weight of water (18.0 lb/lb-mole), the ideal gas constant 21.85 (in. Hg) (ft<sup>3</sup>/lb-mole)(deg R); absolute temperature at standard conditions (528 deg R), absolute pressure at standard conditions (29.92 in. Hg), ft<sup>3</sup>/ml.

0.04715 = Factor which includes the molecular weight of water (18.0 lb/lb-mole), the ideal gas constant 21.85 (in. Hg) (ft<sup>3</sup>/lb-mole)(deg R); absolute temperature at standard conditions (528 deg R), absolute pressure at standard conditions (29.92 in. Hg), and 453.6 g/lb, ft<sup>3</sup>/g.

## 3. Moisture content

$$B_{ws} = \frac{V_w(\text{std})}{V_w(\text{std}) + V_m(\text{std})}$$

$$B_{ws} = \frac{120.783}{120.783 + 70.385} = 0.632$$

Where:

$B_{ws}$  = Proportion of water vapor, by volume, in the gas stream, dimensionless.

#### 4. Mole fraction of dry gas.

$$M_d = 1 - B_{ws}$$

$$M_d = 1 - 0.632 = 0.368$$

Where:

$$M_d = \text{Mole fraction of dry gas, dimensionless.}$$

#### 5. Dry molecular weight of gas stream, lb/lb-mole.

$$MW_d = (0.440 \times \% \text{CO}_2) + (0.320 \times \% \text{O}_2) + (0.280 \times (\% \text{N}_2 + \% \text{CO}))$$

$$\begin{aligned} MW_d &= (0.440 \times 10.10) + (0.320 \times 3.40) + (0.280 \times (86.50 + 0.00)) \\ &= 29.75 \end{aligned}$$

Where:

$$MW_d = \text{Dry molecular weight, lb/lb-mole.}$$

$$\% \text{CO}_2 = \text{Percent carbon dioxide by volume, dry basis.}$$

$$\% \text{O}_2 = \text{Percent oxygen by volume, dry basis.}$$

$$\% \text{N}_2 = \text{Percent nitrogen by volume, dry basis.}$$

$$\% \text{CO} = \text{Percent carbon monoxide by volume, dry basis.}$$

$$0.440 = \text{Molecular weight of carbon dioxide, divided by 100.}$$

$$0.320 = \text{Molecular weight of oxygen, divided by 100.}$$

$$0.280 = \text{Molecular weight of nitrogen or carbon monoxide, divided by 100.}$$

**6. Actual molecular weight of gas stream (wet basis), lb/lb-mole.**

$$MW_s = (MW_d \times M_d) + (18 \times (1 - M_d))$$

$$MW_s = (29.75 \times 0.368) + 18(1 - 0.368) = 22.33$$

Where:

$$MW_s = \text{Molecular weight of wet gas, lb/lb-mole.}$$

$$18 = \text{Molecular weight of water, lb/lb-mole.}$$

**7. Average velocity of gas stream at actual conditions, ft/sec.**

$$V_s = 85.49 \times C_p \times ((\Delta p)^{1/2})_{avg} \times \left( \frac{T_s (avg)}{P_s \times MW_s} \right)^{1/2}$$

$$V_s = 85.49 \times 0.84 \times 0.700269 \times \left( \frac{643}{24.78 \times 22.33} \right)^{1/2} = 54.23$$

Where:

$$V_s = \text{Average gas stream velocity, ft/sec.}$$

$$85.49 = \text{Pitot tube constant, ft/sec} \times \frac{(\text{lb/lb-mole})(\text{in. Hg})^{1/2}}{(\text{deg R})(\text{in H}_2\text{O})}$$

$$C_p = \text{Pitot tube coefficient, dimensionless.}$$

$$T_s = \text{Absolute gas stream temperature, deg R} = T_s, \text{ deg F} + 460.$$

$$P_s = \text{Absolute gas stack pressure, in. Hg.} = P_b + \frac{P(\text{static})}{13.6}$$

$$\Delta p = \text{Velocity head of stack, in. H}_2\text{O.}$$

**8. Average gas stream volumetric flowrate at actual conditions, wacf/hr.**

$$Qs(act) = 3,600 \times Vs \times As$$

$$Qs(act) = 3,600 \times 54.23 \times 9.62 = 1878388$$

Where:

$$Qs(act) = \text{Volumetric flowrate of wet stack gas at actual conditions, wacf/hr.}$$

$$As = \text{Cross-sectional area of stack, ft}^2.$$

**9. Average gas stream dry volumetric flowrate at standard conditions, dscf/hr.**

$$Qs(std) = 17.64 \times Md \times \frac{Ps}{Ts} \times Qs(act)$$

$$Qs(std) = 17.64 \times 0.368 \times \frac{24.78}{643} \times 1878388$$
$$= 469812$$

Where:

$$Qs(std) = \text{Volumetric flowrate of dry stack gas at standard conditions, dscf/hr.}$$

**10. Isokinetic variation calculated from intermediate values, percent.**

$$I = \frac{17.327 \times Ts \times Vm(std)}{Vs \times O \times Ps \times Md \times (Dn)^2}$$

$$I = \frac{17.327 \times 643 \times 70.385}{54.23 \times 120 \times 24.78 \times 0.368 \times (0.363)^2} = 100.30$$

Where:

$$I = \text{Percent of isokinetic sampling.}$$

$$O = \text{Total sampling time, minutes.}$$

$$Dn = \text{Diameter of nozzle, inches.}$$

$$17.327 = \text{Factor which includes standard temperature (528 deg R), standard pressure (29.92 in. Hg), the formula for calculating area of circle } D^2/4, \text{ conversion of square feet to square inches (144), conversion of seconds to minutes (60), and conversion to percent (100),} \\ \frac{(\text{in. Hg})(\text{in}^2)(\text{min})}{(\text{deg R})(\text{ft}^2)(\text{sec})}$$

**11. Particulate Concentration, gr/dscf.**

$$\begin{aligned}C1 &= 15.432 \times \frac{M_t}{V_m(\text{std})} \\C1 &= 15.432 \times \frac{0.11150}{70.385} \\&= 0.02445\end{aligned}$$

Where:

$$\begin{aligned}C1 &= \text{Particulate concentration, gr/dscf.} \\M_t &= \text{Total weight of particulate caught by train} \\&\quad \text{minus the particulate caught by the blank train, gms.} \\15.432 &= \text{Conversion factor from gms to gr.}\end{aligned}$$

**12. Particulate Concentration, gr/wscf.**

$$\begin{aligned}C2 &= C1 \times M_d \\C2 &= 0.02445 \times 0.368 \\&= 0.00900\end{aligned}$$

Where:

$$C2 = \text{Particulate concentration, gr/wscf.}$$

**13. Particulate Concentration, gr/dscf @ 12% CO<sub>2</sub>.**

$$\begin{aligned}C3 &= C1 \times \frac{12}{\% \text{ CO}_2} \\C3 &= C1 \times \frac{12}{10.1} \\&= 0.02905\end{aligned}$$

Where:

$$C3 = \text{Particulate concentration, gr/dscf @ 12\% CO}_2.$$

**14. Particulate Concentration, gr/dscf @ 7% O<sub>2</sub>.**

$$C_4 = C_1 \times \frac{21 - 7}{21 - \% O_2}$$

$$C_4 = C_1 \times \frac{21 - 7}{21 - 3.4}$$

$$= 0.01945$$

Where:

C<sub>4</sub> = Particulate concentration, gr/dscf @ 7% O<sub>2</sub>.

21 = Approximate ambient concentration of Oxygen.

**15. Particulate mass emission rate, lbs/hr.**

$$PMR_t = 0.008571 \times C_1 \times Q_s(\text{std})$$

$$PMR_t = 0.008571 \times 0.02445 \times 469812$$

$$= 1.6407$$

Where:

PMR<sub>t</sub> = Particulate mass emission rate, lbs/hr.

0.008571 = Conversion factor relating grains to pounds (7,000) and minutes to hours.

**16. Hydrogen chloride concentration, lbs/dscf.**

$$C1(HCl) = \frac{W(HCl) \times 2.2046 \times 10^{-6}}{V_m(std)}$$

$$C1(HCl) = \frac{8.6520 \times 2.2046 \times 10^{-6}}{70.385}$$

$$C1(HCl) = 1.90E-03$$

Where:

$W(HCl)$  = Weight of hydrogen chloride collected in sample.

$C1(HCl)$  = Hydrogen chloride concentration, lbs/dscf.

$2.2046 \times 10^{-6}$  = Conversion factor from mg to lbs.

**17. Hydrogen chloride concentration, ppmv.**

$$C2(HCl) = \frac{385.35 \times 10^6}{MW} \times C1(HCl)$$

$$C2(HCl) = \frac{385.35 \times 10^6}{36.45} \times 0.00190$$
$$= 2.863$$

Where:

$C2(HCl)$  = Concentration of HCl in stack gas, parts per million by volume (dry basis).

$385.35 \times 10^6$  = Conversion factor from lbs/ppm.

**18. Hydrogen chloride mass emission rate, lbs/hr.**

$$PMR(HCl) = C1(HCl) \times Qs(std)$$

$$PMR(HCl) = 0.00190 \times 469812$$
$$= 0.1273$$

Where:

$PMR(HCl)$  = Hydrogen chloride mass emission rate, lbs/hr.

# SAMPLE CALCULATIONS FOR VOLATILE ORGANIC COMPOUNDS

Client: RMA  
Test Number: Run 1-1  
Test Location: SQI STACK

Plant: DENVER, CO  
Test Date: 06-10-93  
Test Period: 0808-0828

## 1. Volume of dry gas sampled at standard conditions (68 °F, 29.92 in. Hg), dscf.

$$Vm(std) = \frac{17.64 \times Y \times V_m \times (P_b + \frac{\Delta H}{13.6}) \times 0.035316}{(T_m + 460)}$$

$$Vm(std) = \frac{17.64 \times 0.9963 \times 22.36 \times (24.79 + \frac{1.45}{13.6}) \times 0.035316}{81.95 + 460} = 0.6376$$

Where:

- $Vm(std)$  = Volume of gas sample measured by the dry gas meter, corrected to standard conditions, dscf.
- $V_m$  = Volume of gas sample measured by the dry gas meter at meter conditions, litres.
- $P_b$  = Barometric Pressure, in Hg.
- $\Delta H$  = Average pressure drop across the orifice meter, in  $H_2O$ .
- $T_m$  = Average dry gas meter temperature, °F.
- $Y$  = Dry gas meter calibration factor
- 17.64 = Factor that includes ratio of standard temperature (528 °R) to standard pressure (29.92 in. Hg), °R/in. Hg.
- 13.6 = Specific gravity of mercury.
- 0.035316 = Conversion factor from liters to dcf.

## 2. Carbon Tetrachloride concentration, lbs/dscf.

$$C_1 = \frac{W \times 2.2046 \times 10^{-12}}{V_m(\text{std})}$$

$$\begin{aligned} C_1 &= \frac{17.5 \times 2.2046 \times 10^{-12}}{0.6376} \\ &= 6.05\text{E-}11 \end{aligned}$$

Where:

W = Weight of Carbon Tetrachloride collected in sample in ng.

C<sub>1</sub> = Carbon Tetrachloride concentration, lbs/dscf.

2.2046x10<sup>-12</sup> = Conversion factor from ng to lbs.

## 3. Carbon Tetrachloride concentration, ppmv.

$$\begin{aligned} C_2 &= \frac{385.35 \times 10^6}{\text{MW}} \times C_1 \\ C_2 &= \frac{385.35 \times 10^6}{153.82} \times 6.05\text{E-}11 \\ &= 0.000152 \end{aligned}$$

Where:

C<sub>2</sub> = Concentration of Carbon Tetrachloride in stack gas, parts per million by volume (dry basis).

385.35 x 10<sup>6</sup> = Conversion factor from lbs/ppm.

#### 4. Carbon Tetrachloride mass emission rate, lbs/hr.

$$\text{PMR} = C_1 \times Qs(\text{std}) \times 60 \text{ min/hr}$$

$$\text{PMR} = 6.05\text{E-}11 \times 7775 \times 60$$

$$= 2.82\text{E-}05$$

Where:

PMR = Carbon Tetrachloride mass emission rate, lbs/hr.

Qs(std) = Volumetric flowrate of stack gas at standard conditions, dscf/min.

# SAMPLE CALCULATIONS FOR SEMI-VOLATILE ORGANIC COMPOUNDS

Client: RMA - SQI

Test Number: Run 1

Test Location: INCINERATOR STACK

Plant: DENVER, COLORADO

Test Date: 06-10-93

Test Period: 0745-1501

## 1. Volume of dry gas sampled at standard conditions (68 °F, 29.92 in. Hg), dscf.

$$Vm(std) = \frac{17.64 \times Y \times V_m \times (P_b + \frac{\Delta H}{13.6})}{(T_m + 460)}$$

$$Vm(std) = \frac{17.64 \times 0.9954 \times 160.728 \times (24.79 + \frac{1.35}{13.6})}{75.65 + 460} = 131.135$$

Where:

- $Vm(std)$  = Volume of gas sample measured by the dry gas meter, corrected to standard conditions, dscf.
- $V_m$  = Volume of gas sample measured by the dry gas meter at meter conditions, dcf.
- $P_b$  = Barometric Pressure, in Hg.
- $\Delta H$  = Average pressure drop across the orifice meter, in  $H_2O$ .
- $T_m$  = Average dry gas meter temperature, °F.
- $Y$  = Dry gas meter calibration factor
- 17.64 = Factor that includes ratio of standard temperature (528 °R) to standard pressure (29.92 in. Hg), °R/in. Hg.
- 13.6 = Specific gravity of mercury.

## 2. Volume of water vapor in the gas sample corrected to standard conditions, scf.

$$Vw(std) = (0.04707 \times Vwc) + (0.04715 \times Wwsg)$$

$$Vw(std) = (0.04707 \times 4655.0) + (0.04715 \times 48.0) = 221.374$$

Where:

$Vw(std)$  = Volume of water vapor in the gas sample corrected to standard conditions, scf.

$Vwc$  = Volume of liquid condensed in impingers, ml.

$Wwsg$  = Weight of water vapor collected in silica gel, g.

0.04707 = Factor which includes the density of water (0.002201 lb/ml), the molecular weight of water (18.0 lb/lb-mole), the ideal gas constant 21.85 (in. Hg) (ft<sup>3</sup>)/lb-mole)(°R); absolute temperature at standard conditions (528 °R), absolute pressure at standard conditions (29.92 in. Hg), ft<sup>3</sup>/ml.

0.04715 = Factor which includes the molecular weight of water (18.0 lb/lb-mole), the ideal gas constant 21.85 (in. Hg) (ft<sup>3</sup>)/lb-mole)(°R); absolute temperature at standard conditions (528 °R), absolute pressure at standard conditions (29.92 in. Hg), and 453.6 g/lb, ft<sup>3</sup>/g.

## 3. Moisture content

$$Bws = \frac{Vw(std)}{Vw(std) + Vm(std)}$$

$$Bws = \frac{221.374}{221.374 + 131.135} = 0.628$$

Where:

$Bws$  = Proportion of water vapor, by volum, in the gas stream, dimensionless.

#### 4. Mole fraction of dry gas.

$$M_d = 1 - B_{ws}$$

$$M_d = 1 - 0.628 = 0.372$$

Where:

$$M_d = \text{Mole fraction of dry gas, dimensionless.}$$

#### 5. Dry molecular weight of gas stream, lb/lb-mole.

$$MW_d = (0.440 \times \% \text{CO}_2) + (0.320 \times \% \text{O}_2) + (0.280 \times (\% \text{N}_2 + \% \text{CO}))$$

$$\begin{aligned} MW_d &= (0.440 \times 10.1) + (0.320 \times 3.4) + (0.280 \times (86.5 + 0.0)) \\ &= 29.75 \end{aligned}$$

Where:

$$MW_d = \text{Dry molecular weight, lb/lb-mole.}$$

$$\% \text{CO}_2 = \text{Percent carbon dioxide by volume, dry basis.}$$

$$\% \text{O}_2 = \text{Percent oxygen by volume, dry basis.}$$

$$\% \text{N}_2 = \text{Percent nitrogen by volume, dry basis.}$$

$$\% \text{CO} = \text{Percent carbon monoxide by volume, dry basis.}$$

$$0.440 = \text{Molecular weight of carbon dioxide, divided by 100}$$

$$0.320 = \text{Molecular weight of oxygen, divided by 100}$$

$$0.280 = \text{Molecular weight of nitrogen or carbon monoxide, divided by 100.}$$

**6. Actual molecular weight of gas stream (wet basis), lb/lb-mole.**

$$MW_s = (MW_d \times M_d) + (18 \times (1 - M_d))$$

$$MW_s = (29.75 \times 0.372) + 18 (1 - 0.372) = 22.37$$

Where:

$$MW_s = \text{Molecular weight of wet gas, lb/lb-mole.}$$

$$18 = \text{Molecular weight of water, lb/lb-mole.}$$

**7. Average velocity of gas stream at actual conditions, ft/sec.**

$$V_s = 85.49 \times C_p \times ((\Delta p)^{1/2})_{\text{avg}} \times \left( \frac{T_s (\text{avg})}{P_s \times MW_s} \right)^{1/2}$$

$$V_s = 85.49 \times 0.84 \times 0.680311 \times \left( \frac{644}{24.79 \times 22.37} \right)^{1/2} = 52.66$$

Where:

$$V_s = \text{Average gas stream velocity, ft/sec.}$$

$$85.49 = \text{Pitot tube constant, ft/sec} \times \frac{(\text{lb/lb-mole})(\text{in. Hg})^{1/2}}{(^{\circ}\text{R})(\text{in H}_2\text{O})}$$

$$C_p = \text{Pitot tube coefficient, dimensionless.}$$

$$T_s = \text{Absolute gas stream temperature, } ^{\circ}\text{R} = T_s, ^{\circ}\text{F} + 460.$$

$$P_s = \text{Absolute gas stack pressure, in. Hg.} = P_b + \frac{P(\text{static})}{13.6}$$

$$\Delta p = \text{Velocity head of stack, in. H}_2\text{O.}$$

**8. Average gas stream volumetric flowrate at actual conditions, wacf/hr.**

$$Qs(act) = 3,600 \times Vs \times As$$

$$\begin{aligned} Qs(act) &= 3,600 \times 52.659 \times 9.6211 \\ &= 1823913 \end{aligned}$$

Where:

$$Qs(act) = \text{Volumetric flowrate of wet stack gas at actual conditions, wacf/hr.}$$

$$A_s = \text{Cross-sectional area of stack, ft}^2.$$

$$3,600 = \text{Conversion factor from seconds to hours.}$$

**9. Average gas stream dry volumetric flowrate at standard conditions, dscf/hr.**

$$Qs(std) = 17.64 \times Md \times \frac{P_s}{T_s} \times Qs(act)$$

$$\begin{aligned} Qs(std) &= 17.64 \times 0.372 \times \frac{24.79}{644} \times 1823913 \\ &= 460473 \end{aligned}$$

Where:

$$Qs(std) = \text{Volumetric flowrate of dry stack gas at standard conditions, dscf/hr.}$$

#### 10. Percent of Isokinetic sampling.

$$I = \frac{17.327 \times T_s \times Vm(std)}{V_s \times O \times P_s \times Md \times (D_n)^2}$$

$$I = \frac{17.327 \times 644 \times 131.135}{52.66 \times 240 \times 24.79 \times 22.372 \times (0.355)^2} = 99.7$$

Where:

I = Percent of isokinetic sampling.

O = Total sampling time, minutes.

$D_n$  = Diameter of nozzle, inches.

17.327 = Factor which includes standard temperature (528 °R), standard pressure (29.92 in. Hg), the formula for calculating area of circle  $D^2/4$ , conversion of square feet to square inches (144), conversion of seconds to minutes (60), and conversion to percent (100),  
(in. Hg)(in<sup>2</sup>)(min)  
(°R)(ft<sup>2</sup>)(sec)

#### 11. Diethylphthalate concentration, lbs/dscf.

$$C_1 = \frac{W \times 2.2046 \times 10^{-12}}{Vm(std)}$$

$$C_1 = \frac{9 \times 2.2046 \times 10^{-9}}{131.135}$$
$$= 1.51E-13$$

Where:

W = Weight of Diethylphthalate collected in sample in ug.

$C_1$  = Diethylphthalate concentration, lbs/dscf.

$2.2046 \times 10^{-9}$  = Conversion factor from ug to lbs.

**12. Diethylphthalate concentration, ppbv.**

$$C_2 = \frac{385.35 \times 10^9}{MW} \times C_1$$

$$\begin{aligned} C_2 &= \frac{385.35 \times 10^9}{222.26} \times 1.51E-13 \\ &= 2.62E-04 \end{aligned}$$

Where:

$C_2$  = Concentration of Diethylphthalate in stack gas, parts per billion by volume (dry basis).

$385.35 \times 10^9$  = Conversion factor from lbs/ppm.

**13. Diethylphthalate mass emission rate, lbs/hr.**

$$PMR = C_1 \times Qs(std)$$

$$\begin{aligned} PMR &= 1.51E-13 \times 460473 \\ &= 6.97E-08 \end{aligned}$$

Where:

PMR = Diethylphthalate mass emission rate, lbs/hr.

**14. Diethylphthalate concentration, ug/dscm.**

$$C_2 = W / (Vm(std) \times 0.02832)$$

$$\begin{aligned} C_2 &= 9.0 / (131.135 \times 0.02832) \\ &= 2.42 \end{aligned}$$

Where:

$C_2$  = Diethylphthalate concentration, ug/dscm.

0.02832 = Conversion factor from cubic feet to cubic meters.

# SAMPLE CALCULATIONS FOR DIOXIN/FURAN (EPA METHOD 23)

Client: RMA

Test Number: Run 1

Test Location: SQI STACK

Plant: DENVER, CO

Test Date: 06-10-93

Test Period: 0745-1501

## 1. Volume of dry gas sampled at standard conditions (68 °F, 29.92 in. Hg), dscf.

$$Vm(std) = \frac{17.64 \times Y \times V_m \times (P_b + \frac{\Delta H}{13.6})}{(T_m + 460)}$$

$$Vm(std) = \frac{17.64 \times 1.0100 \times 168.721 \times (24.79 + \frac{1.42}{13.6})}{77.97 + 460} = 139.100$$

Where:

$Vm(std)$  = Volume of gas sample measured by the dry gas meter, corrected to standard conditions, dscf.

$V_m$  = Volume of gas sample measured by the dry gas meter at meter conditions, dcf.

$P_b$  = Barometric Pressure, in Hg.

$\Delta H$  = Average pressure drop across the orifice meter, in  $H_2O$ .

$T_m$  = Average dry gas meter temperature, °F.

$Y$  = Dry gas meter calibration factor

17.64 = Factor that includes ratio of standard temperature (528 °R) to standard pressure (29.92 in. Hg), °R/in. Hg.

13.6 = Specific gravity of mercury.

## 2. Volume of water vapor in the gas sample corrected to standard conditions, scf.

$$Vw(std) = (0.04707 \times Vwc) + (0.04715 \times Wwsg)$$

$$Vw(std) = (0.04707 \times 4851.0) + (0.04715 \times 41.0) = 230.270$$

Where:

$Vw(std)$  = Volume of water vapor in the gas sample corrected to standard conditions, scf.

$Vwc$  = Volume of liquid condensed in impingers, ml.

$Wwsg$  = Weight of water vapor collected in silica gel, g.

0.04707 = Factor which includes the density of water (0.002201 lb/ml), the molecular weight of water (18.0 lb/lb-mole), the ideal gas constant 21.85 (in. Hg) (ft<sup>3</sup>)/lb-mole(°R); absolute temperature at standard conditions (528 °R), absolute pressure at standard conditions (29.92 in. Hg), ft<sup>3</sup>/ml.

0.04715 = Factor which includes the molecular weight of water (18.0 lb/lb-mole), the ideal gas constant 21.85 (in. Hg) (ft<sup>3</sup>)/lb-mole(°R); absolute temperature at standard conditions (528 °R), absolute pressure at standard conditions (29.92 in. Hg), and 453.6 g/lb, ft<sup>3</sup>/g.

## 3. Moisture content

$$Bws = \frac{Vw(std)}{Vw(std) + Vm(std)}$$

$$Bws = \frac{230.270}{230.270 + 139.100} = 0.623$$

Where:

$Bws$  = Proportion of water vapor, by volume, in the gas stream, dimensionless.

#### 4. Mole fraction of dry gas.

$$M_d = 1 - B_{ws}$$

$$M_d = 1 - 0.623 = 0.377$$

Where:

$$M_d = \text{Mole fraction of dry gas, dimensionless.}$$

#### 5. Dry molecular weight of gas stream, lb/lb-mole.

$$MW_d = (0.440 \times \% \text{CO}_2) + (0.320 \times \% \text{O}_2) + (0.280 \times (\% \text{N}_2 + \% \text{CO}))$$

$$MW_d = (0.440 \times 10.1) + (0.320 \times 3.4) + (0.280 \times (86.5 + 0.0))$$

$$= 29.75$$

Where:

$$MW_d = \text{Dry molecular weight, lb/lb-mole.}$$

$$\% \text{CO}_2 = \text{Percent carbon dioxide by volume, dry basis.}$$

$$\% \text{O}_2 = \text{Percent oxygen by volume, dry basis.}$$

$$\% \text{N}_2 = \text{Percent nitrogen by volume, dry basis.}$$

$$\% \text{CO} = \text{Percent carbon monoxide by volume, dry basis.}$$

$$0.440 = \text{Molecular weight of carbon dioxide, divided by 100}$$

$$0.320 = \text{Molecular weight of oxygen, divided by 100}$$

$$0.280 = \text{Molecular weight of nitrogen and carbon monoxide, divided by 100.}$$

**6. Actual molecular weight of gas stream (wet basis), lb/lb-mole.**

$$MW_s = (MW_d \times M_d) + (18 \times (1 - M_d))$$

$$MW_s = (29.75 \times 0.377) + 18(1 - 0.377) = 22.43$$

Where:

$$MW_s = \text{Molecular weight of wet gas, lb/lb-mole.}$$

$$18 = \text{Molecular weight of water, lb/lb-mole.}$$

**7. Average velocity of gas stream at actual conditions, ft/sec.**

$$V_s = 85.49 \times C_p \times ((\Delta p)^{1/2})_{avg} \times \left( \frac{T_s (avg)}{P_s \times MW_s} \right)^{1/2}$$

$$V_s = 85.49 \times 0.84 \times 0.679440 \times \left( \frac{644}{24.79 \times 22.43} \right)^{1/2} = 52.51$$

Where:

$$V_s = \text{Average gas stream velocity, ft/sec.}$$

$$85.49 = \text{Pitot tube constant, ft/sec} \times \frac{(\text{lb/lb-mole})(\text{in. Hg})^{1/2}}{(^{\circ}\text{R})(\text{in H}_2\text{O})}$$

$$C_p = \text{Pitot tube coefficient, dimensionless.}$$

$$T_s = \text{Absolute gas stream temperature, } ^{\circ}\text{R} = T_s, ^{\circ}\text{F} + 460.$$

$$P_s = \text{Absolute gas stack pressure, in. Hg.} = P_b + \frac{P(\text{static})}{13.6}$$

$$\Delta p = \text{Velocity head of stack, in. H}_2\text{O.}$$

**8. Average gas stream volumetric flowrate at actual conditions, wacf/hr.**

$$Qs(act) = 3,600 \times V_s \times A_s$$

$$\begin{aligned} Qs(act) &= 3,600 \times 52.510 \times 9.6210 \\ &= 1818724 \end{aligned}$$

Where:

$$Qs(act) = \text{Volumetric flowrate of wet stack gas at actual conditions, wacf/hr.}$$

$$A_s = \text{Cross-sectional area of stack, ft}^2.$$

$$3600 = \text{Conversion factor from seconds to hours.}$$

**9. Average gas stream dry volumetric flowrate at standard conditions, dscf/hr.**

$$Qs(std) = 17.64 \times Md \times \frac{P_s}{T_s} \times Qs(act)$$

$$\begin{aligned} Qs(std) &= 17.64 \times 0.377 \times \frac{24.79}{644} \times 1818724 \\ &= 465146 \end{aligned}$$

Where:

$$Qs(std) = \text{Volumetric flowrate of dry stack gas at standard conditions, dscf/hr.}$$

$$I = \frac{17.327 \times T_s \times Vm(std)}{V_s \times O \times P_s \times Md \times (D_n)^2}$$

$$I = \frac{17.327 \times 644 \times 139.100}{52.51 \times 240 \times 24.79 \times 22.426 \times (0.355)^2} = 104.7$$

Where:

I = Percent of isokinetic sampling.

O = Total sampling time, minutes.

D<sub>n</sub> = Diameter of nozzle, inches.

17.327 = Factor which includes standard temperature (528 °R), standard pressure (29.92 in. Hg), the formula for calculating area of circle D<sup>2</sup>/4, conversion of square feet to square inches (144), conversion of seconds to minutes (60), and conversion to percent (100),  
(in. Hg)(in<sup>2</sup>)(min)  
(°R)(ft<sup>2</sup>)(sec)

#### 11. 2,3,7,8-TCDF concentration, lbs/dscf.

$$C_1 = \frac{W \times 2.2046 \times 10^{-12}}{Vm(std)}$$

$$C_1 = \frac{0.0200 \times 2.2046 \times 10^{-12}}{139.100}$$

$$= 3.17E-16$$

Where:

W = Weight of 2,3,7,8-TCDF collected in sample in ng.

C<sub>1</sub> = 2,3,7,8-TCDF concentration, lbs/dscf.

2.2046x10<sup>-12</sup> = Conversion factor from ng to lbs.

**12. 2,3,7,8-TCDF concentration, ng/dscm.**

$$C_2 = W / ( Vm(std) \times 0.02832)$$

$$\begin{aligned} C_2 &= 0.0200 / ( 139.100 \times 0.02832 ) \\ &= 0.0051 \end{aligned}$$

Where:

$$C_2 = 2,3,7,8\text{-TCDF concentration, ng/dscm.}$$

$$0.02832 = \text{Conversion factor from cubic feet to cubic meeters.}$$

**13. 2,3,7,8-TCDF mass emission rate, lbs/hr.**

$$PMR = C_1 \times Qs(std) \times 60 \text{ min/hr}$$

$$\begin{aligned} PMR &= 3.17E-16 \times 7752 \times 60 \\ &= 1.47E-10 \end{aligned}$$

Where:

$$PMR = 2,3,7,8\text{-TCDF mass emission rate, lbs/hr.}$$

# SAMPLE CALCULATIONS FOR EPA MULTI-METALS METHOD

Client: RMA - SQI  
Test Number: Run 1  
Test Location: INCINERATOR STACK

Plant: DENVER, COLORADO  
Test Date: 06-10-93  
Test Period: 0745-1032

## 1. Volume of dry gas sampled at standard conditions (68 °F, 29.92 in. Hg), dscf.

$$Vm(std) = \frac{17.64 \times Y \times V_m \times (P_b + \frac{\Delta H}{13.6})}{(T_m + 460)}$$

$$Vm(std) = \frac{17.64 \times 1.0010 \times 91.757 \times (24.79 + \frac{1.75}{13.6})}{78.50 + 460} = 74.974$$

Where:

- $Vm(std)$  = Volume of gas sample measured by the dry gas meter, corrected to standard conditions, dscf.
- $V_m$  = Volume of gas sample measured by the dry gas meter at meter conditions, dcf.
- $P_b$  = Barometric Pressure, in Hg.
- $\Delta H$  = Average pressure drop across the orifice meter, in  $H_2O$ .
- $T_m$  = Average dry gas meter temperature, °F.
- $Y$  = Dry gas meter calibration factor
- 17.64 = Factor that includes ratio of standard temperature (528 °R) to standard pressure (29.92 in. Hg), °R/in. Hg.
- 13.6 = Specific gravity of mercury.

## 2. Volume of water vapor in the gas sample corrected to standard conditions, scf.

$$V_w(\text{std}) = (0.04707 \times V_{wc}) + (0.04715 \times W_{wsg})$$

$$V_w(\text{std}) = (0.04707 \times 2712.0) + (0.04715 \times 23.0) = 128.738$$

Where:

$V_w(\text{std})$  = Volume of water vapor in the gas sample corrected to standard conditions, scf.

$V_{wc}$  = Volume of liquid condensed in impingers, ml.

$W_{wsg}$  = Weight of water vapor collected in silica gel, g.

0.04707 = Factor which includes the density of water (0.002201 lb/ml), the molecular weight of water (18.0 lb/lb-mole), the ideal gas constant 21.85 (in. Hg) (ft<sup>3</sup>)/lb-mole)(°R); absolute temperature at standard conditions (528 °R), absolute pressure at standard conditions (29.92 in. Hg), ft<sup>3</sup>/ml.

0.04715 = Factor which includes the molecular weight of water (18.0 lb/lb-mole), the ideal gas constant 21.85 (in. Hg) (ft<sup>3</sup>)/lb-mole)(°R); absolute temperature at standard conditions (528 °R), absolute pressure at standard conditions (29.92 in. Hg), and 453.6 g/lb, ft<sup>3</sup>/g.

## 3. Moisture content

$$B_{ws} = \frac{V_w(\text{std})}{V_w(\text{std}) + V_m(\text{std})}$$

$$B_{ws} = \frac{128.738}{128.738 + 74.974} = 0.632$$

Where:

$B_{ws}$  = Proportion of water vapor, by volume, in the gas stream, dimensionless.

#### 4. Mole fraction of dry gas.

$$M_d = 1 - B_{ws}$$

$$M_d = 1 - 0.632 = 0.368$$

Where:

$$M_d = \text{Mole fraction of dry gas, dimensionless.}$$

#### 5. Dry molecular weight of gas stream, lb/lb-mole.

$$MW_d = (0.440 \times \% \text{CO}_2) + (0.320 \times \% \text{O}_2) + (0.280 \times (\% \text{N}_2 + \% \text{CO}))$$

$$\begin{aligned} MW_d &= (0.440 \times 10.1) + (0.320 \times 3.4) + (0.280 \times (86.5 + 0.0)) \\ &= 29.75 \end{aligned}$$

Where:

$$MW_d = \text{Dry molecular weight, lb/lb-mole.}$$

$$\% \text{CO}_2 = \text{Percent carbon dioxide by volume, dry basis.}$$

$$\% \text{O}_2 = \text{Percent oxygen by volume, dry basis.}$$

$$\% \text{N}_2 = \text{Percent nitrogen by volume, dry basis.}$$

$$\% \text{CO} = \text{Percent carbon monoxide by volume, dry basis.}$$

$$0.440 = \text{Molecular weight of carbon dioxide, divided by 100}$$

$$0.320 = \text{Molecular weight of oxygen, divided by 100}$$

$$0.280 = \text{Molecular weight of nitrogen or carbon monoxide, divided by 100.}$$

**6. Actual molecular weight of gas stream (wet basis), lb/lb-mole.**

$$MW_s = (MW_d \times M_d) + (18 \times (1 - M_d))$$

$$MW_s = (29.75 \times 0.368) + 18(1 - 0.368) = 22.33$$

Where:

$MW_s$  = Molecular weight of wet gas, lb/lb-mole.

18 = Molecular weight of water, lb/lb-mole.

**7. Average velocity of gas stream at actual conditions, ft/sec.**

$$V_s = 85.49 \times C_p \times ((\Delta p)^{1/2})_{avg} \times \left( \frac{T_s (avg)}{P_s \times MW_s} \right)^{1/2}$$

$$V_s = 85.49 \times 0.84 \times 0.700509 \times \left( \frac{645}{24.78 \times 22.33} \right)^{1/2} = 54.30$$

Where:

$V_s$  = Average gas stream velocity, ft/sec.

$$85.49 = \text{Pitot tube constant, ft/sec} \times \frac{(\text{lb/lb-mole})(\text{in. Hg})^{1/2}}{(^{\circ}\text{R})(\text{in H}_2\text{O})}$$

$C_p$  = Pitot tube coefficient, dimensionless.

$T_s$  = Absolute gas stream temperature,  $^{\circ}\text{R} = T_s, ^{\circ}\text{F} + 460$ .

$$P_s = \text{Absolute gas stack pressure, in. Hg.} = P_b + \frac{P(\text{static})}{13.6}$$

$\Delta p$  = Velocity head of stack, in.  $\text{H}_2\text{O}$ .

**8. Average gas stream volumetric flowrate at actual conditions, wacf/hr.**

$$Qs(act) = 3,600 \times Vs \times As$$

$$\begin{aligned} Qs(act) &= 3,600 \times 54.300 \times 9.6211 \\ &= 1880745 \end{aligned}$$

Where:

$Qs(act)$  = Volumetric flowrate of wet stack gas at actual conditions, wacf/hr.

$A_s$  = Cross-sectional area of stack, ft<sup>2</sup>.

3600 = Conversion factor from seconds to hours.

**9. Average gas stream dry volumetric flowrate at standard conditions, dscf/hr.**

$$Qs(std) = 17.64 \times Md \times \frac{P_s}{T_s} \times Qs(act)$$

$$\begin{aligned} Qs(std) &= 17.64 \times 0.368 \times \frac{24.78}{645} \times 1880745 \\ &= 469396 \end{aligned}$$

Where:

$Qs(std)$  = Volumetric flowrate of dry stack gas at standard conditions, dscf/hr.

**10. Isokinetic variation calculated from intermediate values, percent.**

$$I = \frac{17.327 \times T_s \times V_m(\text{std})}{V_s \times O \times P_s \times M_d \times (D_n)^2}$$

$$I = \frac{17.327 \times 645 \times 74.974}{54.30 \times 120 \times 24.78 \times 22.325 \times (0.375)^2} = 100.2$$

Where:

I = Percent of isokinetic sampling.

O = Total sampling time, minutes.

$D_n$  = Diameter of nozzle, inches.

17.327 = Factor which includes standard temperature (528 °R), standard pressure (29.92 in. Hg), the formula for calculating area of circle  $D^2/4$ , conversion of square feet to square inches (144), conversion of seconds to minutes (60), and conversion to percent (100),  
(in. Hg)(in<sup>2</sup>)(min)  
(°R)(ft<sup>2</sup>)(sec)

**11. Lead concentration, ug/dscm.**

$$\begin{aligned}C_1 &= W / ( Vm(std) \times 0.02832) \\C_1 &= 56.2500 / ( 74.974 \times 0.02832) \\&= 26.4923\end{aligned}$$

Where:

$$\begin{aligned}C_1 &= \text{Lead concentration, ug/dscm.} \\0.02832 &= \text{Conversion factor from cubic feet to cubic meters.} \\W &= \text{Weight of lead collected in sample, ug}\end{aligned}$$

**12. Lead concentration, lb/dscf.**

$$\begin{aligned}C_2 &= \frac{W \times 2.2046 \times 10^{-9}}{Vm(std)} \\C_2 &= \frac{56.25 \times 2.2046 \times 10^{-9}}{74.974} \\&= 1.65E-09\end{aligned}$$

Where:

$$\begin{aligned}C_2 &= \text{Concentration of lead, lb/dscf.} \\2.2046 \times 10^{-9} &= \text{Conversion factor from ug to lbs.}\end{aligned}$$

**13. Lead mass emission rate, lbs/hr.**

$$\begin{aligned}PMR &= C_2 \times Qs(std) \\PMR &= 1.65 \times 10^{-9} \times 7823 \\&= 7.76E-04\end{aligned}$$

Where:

$$PMR = \text{Lead mass emission rate, lbs/hr.}$$

# SAMPLE CALCULATIONS FOR HEXAVALENT CHROMIUM TEST

Client: RMA - SQI

Test Number: Run 1

Test Location: INCINERATOR STACK

Plant: DENVER, COLORADO

Test Date: 06-10-93

Test Period: 1130-1552

## 1. Volume of dry gas sampled at standard conditions (68 °F, 29.92 in. Hg), dscf.

$$Vm_{(std)} = \frac{17.64 \times Y \times V_m \times (P_b + \frac{\Delta H}{13.6})}{(T_m + 460)}$$

$$Vm_{(std)} = \frac{17.64 \times 0.9923 \times 79.721 \times (24.79 + \frac{1.27250}{13.6})}{87.80 + 460} = 63.388$$

Where:

$Vm_{(std)}$  = Volume of gas sample measured by the dry gas meter, corrected to standard conditions, dscf.

$V_m$  = Volume of gas sample measured by the dry gas meter at meter conditions, dcf.

$P_b$  = Barometric Pressure, in Hg.

$\Delta H$  = Average pressure drop across the orifice meter, in  $H_2O$ .

$T_m$  = Average dry gas meter temperature, °F.

$Y$  = Dry gas meter calibration factor.

17.64 = Factor that includes ratio of standard temperature (528 °R) to standard pressure (29.92 in. Hg), °R/in. Hg.

13.6 = Specific gravity of mercury.

## 2. Volume of water vapor in the gas sample corrected to standard conditions, scf.

$$V_{w(std)} = (0.04707 \times V_{wc}) + (0.04715 \times W_{wsg})$$

$$V_{w(std)} = (0.04707 \times 2255.0) + (0.04715 \times 58.0) = 108.878$$

Where:

$V_{w(std)}$  = Volume of water vapor in the gas sample corrected to standard conditions, scf.

$V_{wc}$  = Volume of liquid condensed in impingers, ml.

$W_{wsg}$  = Weight of water vapor collected in silica gel, g.

0.04707 = Factor which includes the density of water (0.002201 lb/ml), the molecular weight of water (18.0 lb/lb-mole), the ideal gas constant 21.85 (in. Hg) (ft<sup>3</sup>)/lb-mole(°R); absolute temperature at standard conditions (528 °R), absolute pressure at standard conditions (29.92 in. Hg), ft<sup>3</sup>/ml.

0.04715 = Factor which includes the molecular weight of water (18.0 lb/lb-mole), the ideal gas constant 21.85 (in. Hg) (ft<sup>3</sup>)/lb-mole(°R); absolute temperature at standard conditions (528 °R), absolute pressure at standard conditions (29.92 in. Hg), and 453.6 g/lb, ft<sup>3</sup>/g.

## 3. Moisture content

$$B_{ws} = \frac{V_{w(std)}}{V_{w(std)} + V_{m(std)}}$$

$$B_{ws} = \frac{108.878}{108.878 + 63.388} = 0.632$$

Where:

$B_{ws}$  = Proportion of water vapor, by volume, in the gas stream, dimensionless.

#### 4. Mole fraction of dry gas.

$$\begin{aligned}M_d &= 1 - B_{ws} \\&= 1 - 0.632 = 0.368\end{aligned}$$

Where:

$$M_d = \text{Mole fraction of dry gas, dimensionless.}$$

#### 5. Dry molecular weight of gas stream, lb/lb-mole.

$$\begin{aligned}MW_d &= (0.440 \times \% \text{CO}_2) + (0.320 \times \% \text{O}_2) + (0.280 \times (\% \text{N}_2 + \% \text{CO})) \\MW_d &= (0.440 \times 10.10) + (0.320 \times 3.40) + (0.280 \times (86.50 + 0.00)) \\&= 29.75\end{aligned}$$

Where:

$$MW_d = \text{Dry molecular weight, lb/lb-mole.}$$

$$\% \text{CO}_2 = \text{Percent carbon dioxide by volume, dry basis.}$$

$$\% \text{O}_2 = \text{Percent oxygen by volume, dry basis.}$$

$$\% \text{N}_2 = \text{Percent nitrogen by volume, dry basis.}$$

$$\% \text{CO} = \text{Percent carbon monoxide by volume, dry basis.}$$

$$0.440 = \text{Molecular weight of carbon dioxide, divided by 100.}$$

$$0.320 = \text{Molecular weight of oxygen, divided by 100.}$$

$$0.280 = \text{Molecular weight of nitrogen or carbon monoxide, divided by 100.}$$

**6. Actual molecular weight of gas stream (wet basis), lb/lb-mole.**

$$MW_s = (MW_d \times M_d) + (18 \times (1 - M_d))$$

$$MW_s = (29.75 \times 0.368) + 18(1 - 0.368) = 22.32$$

Where:

$$MW_s = \text{Molecular weight of wet gas, lb/lb-mole.}$$

$$18 = \text{Molecular weight of water, lb/lb-mole.}$$

**7. Average velocity of gas stream at actual conditions, ft/sec.**

$$V_s = 85.49 \times C_p \times ((\Delta p)^{1/2})_{avg} \times \left( \frac{T_{s(avg)}}{P_s \times MW_s} \right)^{1/2}$$

$$V_s = 85.49 \times 0.84 \times 0.649930 \times \left( \frac{643}{24.77 \times 22.32} \right)^{1/2} = 50.32$$

Where:

$$V_s = \text{Average gas stream velocity, ft/sec.}$$

$$85.49 = \text{Pitot tube constant, ft/sec} \times \frac{(\text{lb/lb-mole})(\text{in. Hg})^{1/2}}{(^{\circ}\text{R})(\text{in H}_2\text{O})}$$

$$C_p = \text{Pitot tube coefficient, dimensionless.}$$

$$T_s = \text{Absolute gas stream temperature, } ^{\circ}\text{R} = T_s, ^{\circ}\text{F} + 460.$$

$$P_s = \text{Absolute gas stack pressure, in. Hg.} = P_b + \frac{P_{(static)}}{13.6}$$

$$\Delta p = \text{Velocity head of stack, in. H}_2\text{O.}$$

**8. Average gas stream volumetric flowrate at actual conditions, wacf/min.**

$$Q_{S(act)} = 60 \times V_s \times A_s$$

$$\begin{aligned} Q_{S(act)} &= 60 \times 50.32 \times 9.62 \\ &= 29047 \end{aligned}$$

Where:

$$Q_{S(act)} = \text{Volumetric flowrate of wet stack gas at actual conditions, wacf/min.}$$

$$A_s = \text{Cross-sectional area of stack, ft}^2.$$

**9. Average gas stream dry volumetric flowrate at standard conditions, dscf/min.**

$$Q_{S(std)} = 17.64 \times M_d \times \frac{P_s}{T_s} \times Q_{S(act)}$$

$$\begin{aligned} Q_{S(std)} &= 17.64 \times 0.368 \times \frac{24.77}{643} \times 29047 \\ &= 7266 \end{aligned}$$

Where:

$$Q_{S(std)} = \text{Volumetric flowrate of dry stack gas at standard conditions, dscf/min.}$$

#### 10. Isokinetic variation calculated from intermediate values, percent.

$$I = \frac{17.327 \times T_s \times V_{m(std)}}{V_s \times O \times P_s \times M_d \times (D_n)^2}$$

$$I = \frac{17.327 \times 643 \times 63.388}{50.32 \times 120 \times 24.77 \times 0.368 \times (0.354)^2} = 102.36$$

Where:

I = Percent of isokinetic sampling.

O = Total sampling time, minutes.

D<sub>n</sub> = Diameter of nozzle, inches.

17.327 = Factor which includes standard temperature (528 °R), standard pressure (29.92 in. Hg), the formula for calculating area of circle  $D_n^2/4$ , conversion of square feet to square inches (144), conversion of seconds to minutes (60), and conversion to percent (100),  

$$\frac{(\text{in. Hg})(\text{in}^2)(\text{min})}{(^\circ\text{R})(\text{ft}^2)(\text{sec})}$$

#### 11. Cr<sup>+6</sup> Concentration, ug/dscm.

$$C_1 = 35.31 \times \frac{C_t}{V_{m(std)}}$$

$$C_1 = 35.31 \times \frac{0.3700}{63.388}$$

$$= 0.2061$$

Where:

C<sub>1</sub> = Cr<sup>+6</sup> concentration, ug/dscm.

C<sub>t</sub> = Total Cr<sup>+6</sup> catch, ug.

35.31 = Conversion factor from cubic feet to cubic meters.

**12. Cr<sup>+6</sup> Concentration, lb/dscf.**

$$C_2 = 2.205E-9 \times \frac{C_t}{Vm_{(std)}}$$

$$C_2 = 2.205E-9 \times \frac{0.3700}{63.388}$$

$$= 1.29E-11$$

Where:

$C_2$  = Cr<sup>+6</sup> concentration, lb/dscf.

$C_t$  = Total Cr<sup>+6</sup> catch, ug.

2.205E-9 = Conversion factor from ug to lbs.

**13. Cr<sup>+6</sup> mass emission rate, lbs/hr.**

$$CMR_t = C_2 \times Q_{s(std)}$$

$$CMR_t = 0.000000000013 \times 7266 \times 60$$

$$= 5.61E-06$$

Where:

60 = Conversion factor from lbs/min to lbs/hr.

$CMR_t$  = Cr<sup>+6</sup> mass emission rate, lbs/hr.

$Q_{s(std)}$  = Volumetric flowrate of dry stack gas at standard conditions, dscf/min.

**RMA - SQI  
DENVER, COLORADO  
TRIAL BURN TEST PROGRAM  
SUMMARY OF DIOXIN AND FURAN TOXIC EQUIVALENCY FACTORS**

TEST DATA		1	2	3
Test run number			INCINERATOR STACK	
Test location				
Test date		06-10-93	06-11-93	06-12-93
Test time period	TE FACTORS	0745-1501	0710-1258	0756-1416
TOXICITY EQUIVALENCY EMISSIONS, lb/hr				
	(I-TEFs/89)			
2,3,7,8-TCDD	1	0	0	0
1,2,3,7,8-PeCDD	0.5	0	0	0
1,2,3,4,7,8-HxCDD	0.1	0	0	0
1,2,3,6,7,8-HxCDD	0.1	0	0	0
1,2,3,7,8,9-HxCDD	0.1	0	0	0
1,2,3,4,6,7,8-HpCDD	0.01	1.5E-12	0	1.5E-12
1,2,3,4,6,7,8,9-OCDD	0.001	2.9E-13	2.2E-13	5.1E-13
Total TCDD	0	0	0	0
Total PeCDD	0	0	0	0
Total HxCDD	0	0	0	0
Total HpCDD	0	0	0	0
2,3,7,8-TCDF	0.1	1.5E-11	1.5E-11	0
1,2,3,7,8-PeCDF	0.05	0	0	0
2,3,4,7,8-PeCDF	0.5	0	0	0
1,2,3,4,7,8-HxCDF	0.1	1.5E-11	0	0
1,2,3,6,7,8-HxCDF	0.1	0	0	0
1,2,3,7,8,9-HxCDF	0.1	0	0	0
2,3,4,6,7,8-HxCDF	0.1	0	1.5E-12	0
1,2,3,4,6,7,8-HpCDF	0.01	1.5E-12	7.5E-13	0
1,2,3,4,7,8,9-HpCDF	0.01	0	0	0
1,2,3,4,6,7,8,9-OCDF	0.001	0	0	0
Total TCDF	0	0	0	0
Total PeCDF	0	0	0	0
Total HxCDF	0	0	0	0
Total HpCDF	0	0	0	0
TOTAL 2,3,7,8-TCDD/TCDF EQUIVALENTS, lb/hr		3.27E-11	1.74E-11	1.98E-12

**RMA-SQI  
DENVER COLORADO  
DRE TEST RESULTS  
BASED ON 93% POHC PURITY**

<b>DRE TEST RESULTS</b>			
	<b>TEST RUN NUMBER</b>		
	<b>ONE</b>	<b>TWO</b>	<b>THREE</b>
<b>Carbon Tetrachloride</b>			
Feed rate lb/hr	6.42	8.05	8.18
Emission rate lb/hr	ND<(8.26 x 10 <sup>-5</sup> )	8.98 x 10 <sup>-5</sup>	ND<(8.92 x 10 <sup>-5</sup> )
DRE (%)	>99.9987	99.9989	>99.9989
<b>Chlorobenzene</b>			
Feed rate lb/hr	8.05	8.35	8.18
Emission rate lb/hr	3.20 x 10 <sup>-5</sup>	ND<(8.58 x 10 <sup>-5</sup> )	ND<(8.71 x 10 <sup>-5</sup> )
DRE (%)	99.9996	>99.9989	>99.9989

The above calculated DRE is based on a POHC purity of 93% derived from the actual analyses of samples obtained from each POHC. The DRE is calculated as follows:

$$DRE = \frac{W_{in} - W_{out}}{W_{in}} \times 100$$

Where:

$W_{in}$  = POHC mass rate in  
 $W_{out}$  = POHC mass rate out (stack emissions)